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TECHNICAL REPORT  
NATICK TR-80/020

**PRODUCTION OF  
- INSULATED FOOTWEAR USING  
LIQUID INJECTION MOLDING EQUIPMENT  
2. INSTRUCTION MANUAL**

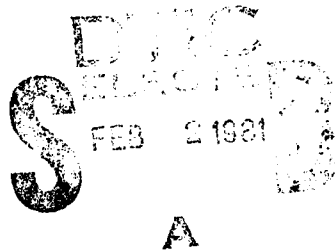
by

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Naugatuck, Ct

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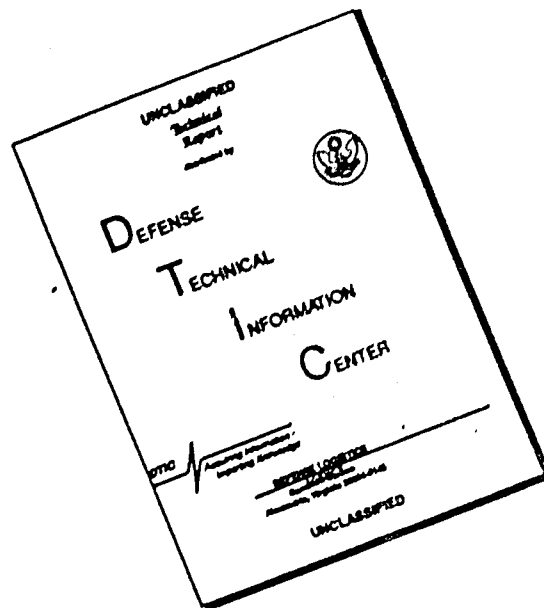


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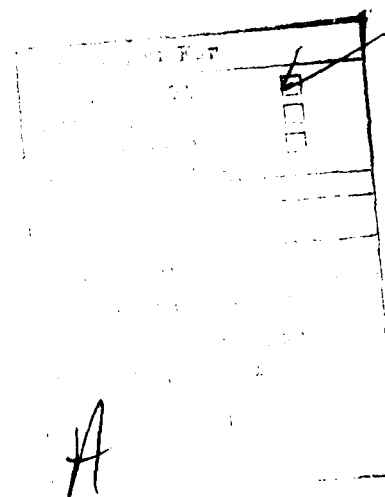
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This is an instruction manual for using the liquid injection molding equip- ment in the production of insulated footwear as reported in Technical Report NATICK/TR-80/019.			

PRODUCTION OF INSULATED FOOTWEAR  
USING LIQUID INJECTION MOLDING EQUIPMENT

2. INSTRUCTION MANUAL



## SUMMARY

→ A manufacturing line has been designed, fabricated and installed to produce finished lightweight insulated footwear from liquid injection molded expanded polyurethane. The minimum production rate is sixty pair of boots per week, utilizing the equipment one shift per day, five days per week. These boots will meet established design criteria and required physical properties. The equipment is capable of producing boots in a size range of 4 through 14 and widths from XN to XW.

The method being used for production of lightweight insulated boots consists of molding a fabric lined urethane foam upper utilizing four individual mold unit stations and a three-stream foam injection unit. The uppers are trimmed, buffed and sprayed with a release coat in specific areas. A fabric tube sock is then slipped over the foam upper. The uppers are "banked" until sufficient quantities are produced to warrant switching the equipment to the outsole producing cycle. During this operation using the same mold stations, the upper is released and the outsole is then molded to the upper using a two-stream system in the foam injection unit. After curing, the boot is stripped, trimmed, and buffed.

At this point the boot is ready for application of the outer skin coating. An electrostatic spray unit is used to coat the boots with a tough urethane film. The basic principle is to pump two components to a spinning disc, mixing the components just prior to depositing in a well located in the center of the disc. The disc can be

programmed to raise and lower in order to deposit the coating where desired from top to bottom of the boot. The spinning disc "sprays" the coating toward the rotating boot and the urethane particles are electrostatically attracted to the boot. After coating, the boot is cured and then trimmed to the top edge and the snow collar attached. Approved boots thus finished are final inspected, mated left foot to right foot of the same size and width and transported to the packing area for pack out and shipment.

→ This Instruction Manual describes the production equipment and its functions, production methods, and process conditions required to fabricate the lightweight insulated boot. Detailed prints and photographs are included for the major equipment pieces. ← For additional detailed information including trouble shooting maintenance procedures and parts lists on the major pieces of equipment, the equipment manuals supplied by the manufacturers must be consulted. These manuals are kept with the individual pieces of equipment for ready reference. Duplicate copies of the manuals can be purchased from the equipment suppliers if desired.

All prints are copied as supplied and were not converted to metric dimensions if supplied in English units because the cost of this operation would be prohibitive.

Cycle times for the various operations are included. The equipment layout and operations flow chart are listed.

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## PRODUCTION OF INSULATED FOOTWEAR USING LIQUID INJECTION MOLDING EQUIPMENT

### 2. INSTRUCTION MANUAL

#### 1. INTRODUCTION

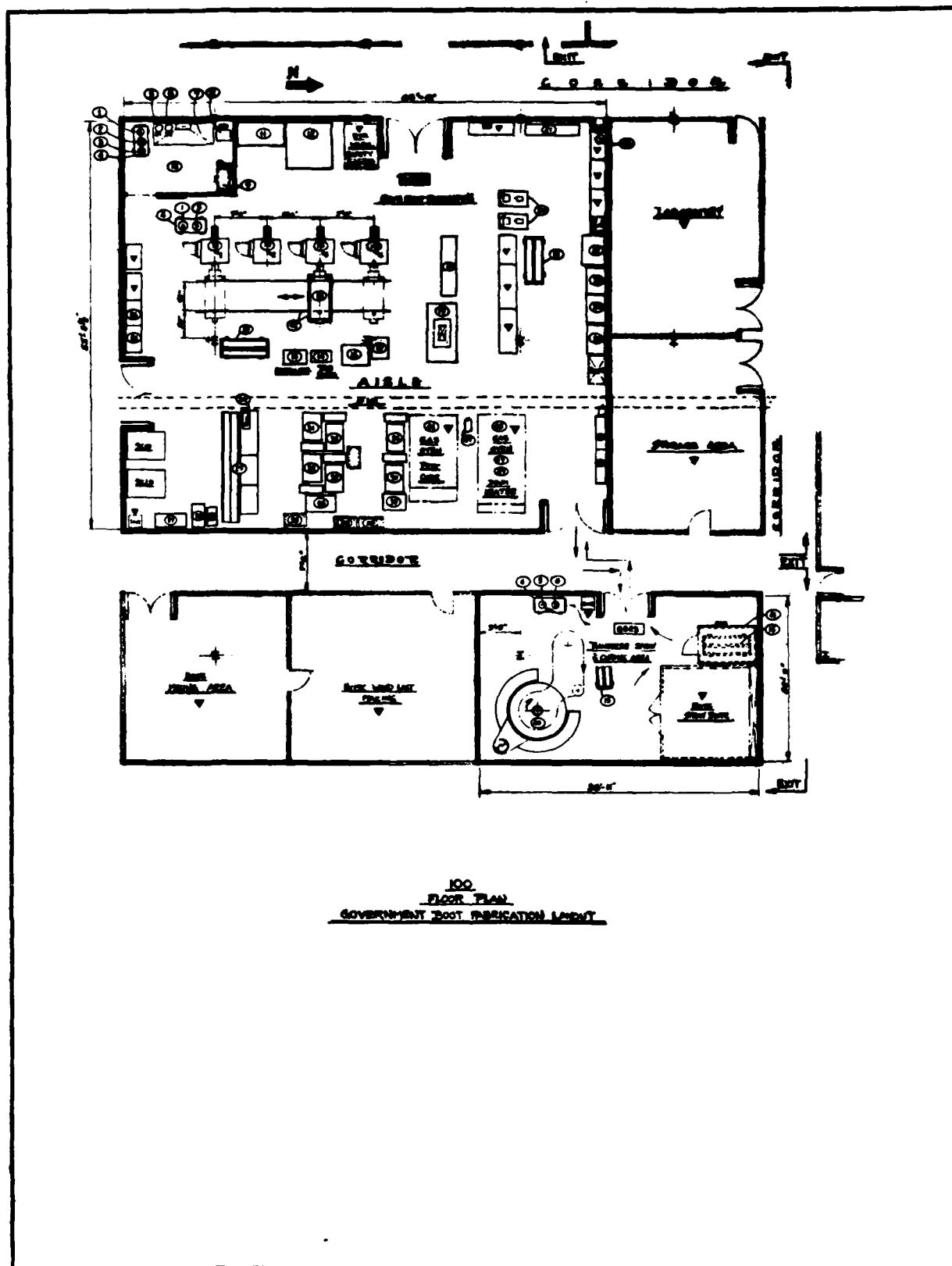
The overall operation as it currently is set up is shown on Figure 1. This schematic shows the location of the various pieces of equipment. The process flow is shown in Figure 2 and lists the various operations in the sequence as performed in order to make a lightweight insulated boot. The various major operations will be listed and broken down into an equipment description followed by an itemized process description to complete each phase of the total operation of producing a boot. Detailed prints and photographs of the major pieces of equipment and their component parts are included to better illustrate their appearance and functions.

#### II. COMPOUND PREPARATION

Before starting this phase of the operation, review the Materials Listing - Chemicals, Section D, Typical Chemical Properties, Sections E and F; Chemical Storage Requirements, Section G, and In-Process Chemical Storage, Section H.

##### A. Mixing Tanks

The mixing tanks for the "A" component, Figure 3, and for the "B" component Figure 4, are 5-gallon (18.9-liter)



GOVERNMENT BOOT FABRICATION LAYOUT			
ITEM	QUANTITY	UNIT	REMARKS
1	1	A-12	
2	1	A-12	
3	1	A-12	
4	1	A-12	
5	1	A-12	
6	1	A-12	
7	1	A-12	
8	1	A-12	
9	1	A-12	
10	1	A-12	
11	1	A-12	
12	1	A-12	
13	1	A-12	
14	1	A-12	
15	1	A-12	
16	1	A-12	
17	1	A-12	
18	1	A-12	
19	1	A-12	
20	1	A-12	
21	1	A-12	
22	1	A-12	
23	1	A-12	
24	1	A-12	
25	1	A-12	
26	1	A-12	
27	1	A-12	
28	1	A-12	
29	1	A-12	
30	1	A-12	
31	1	A-12	
32	1	A-12	
33	1	A-12	
34	1	A-12	
35	1	A-12	
36	1	A-12	
37	1	A-12	
38	1	A-12	
39	1	A-12	
40	1	A-12	
41	1	A-12	
42	1	A-12	
43	1	A-12	
44	1	A-12	
45	1	A-12	
46	1	A-12	
47	1	A-12	
48	1	A-12	
49	1	A-12	

1 - DRAWING 1

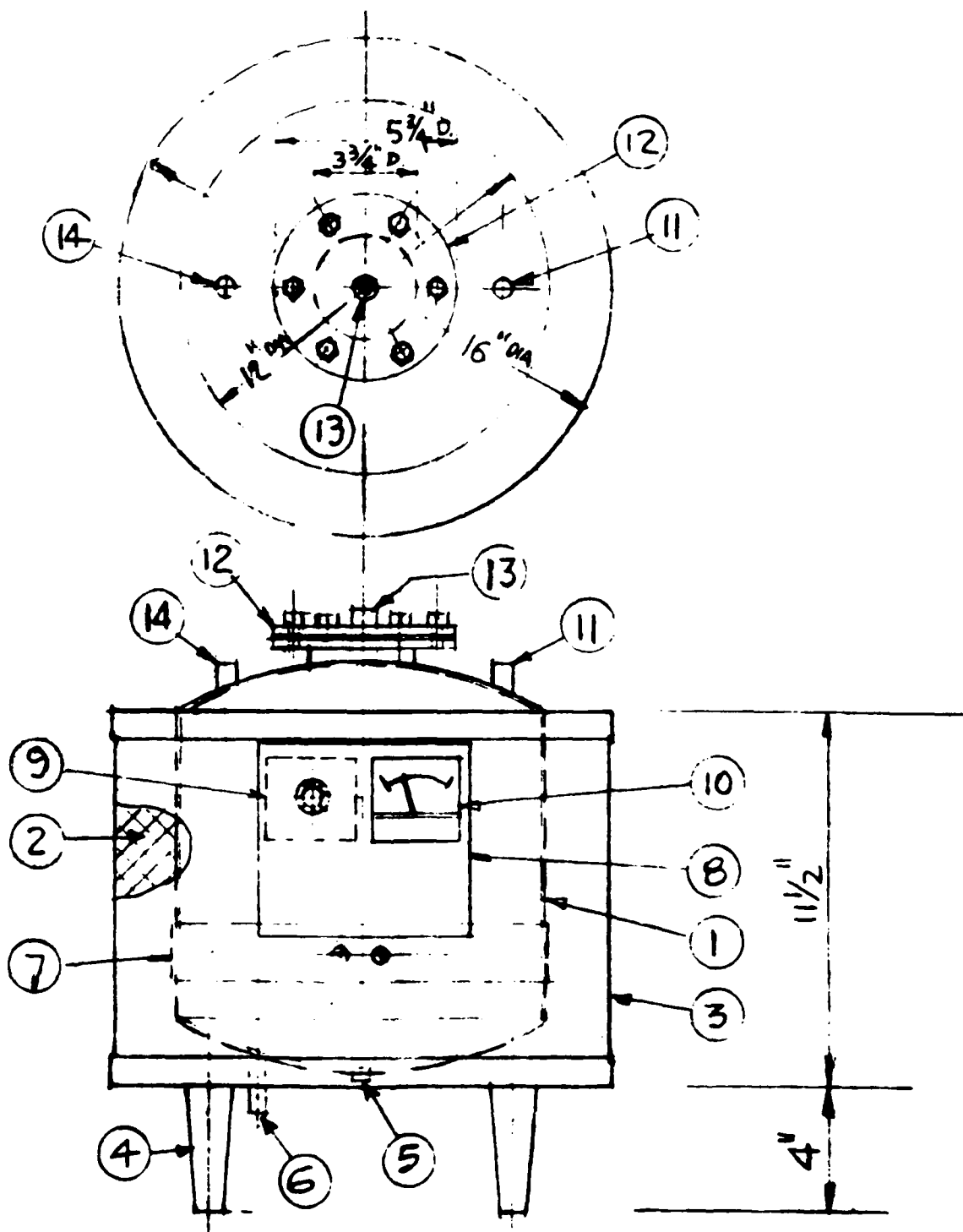






D-110675

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R. NO	LIST OF PARTS	SIZE
1	TANK-STAINLESS STEEL TYPE 316	5 GAL. CAP.
2	FIBERGLASS INSULATION 2" THICK	
3	CASING-STEEL	
4	LEG-ADJUSTABLE 4"	
5	THERMISTER PROBE	1/4" IPS
6	OUTLET-NIPPLE	1/2" IPS
7	HEATER ELEMENT	HBT-120
8	ENCLOSURE NEMA 1	
9	CONTROLLER	SERIES 194
10	METER-INDICATING	
11	FILL-COUPLING	1/2" IPS
12	HAND HOLE	
13	COUPLING-AGITATOR	3/4" IPS
14	COUPLING-RELIEF VALVE	1/2" IPS

Figure 3

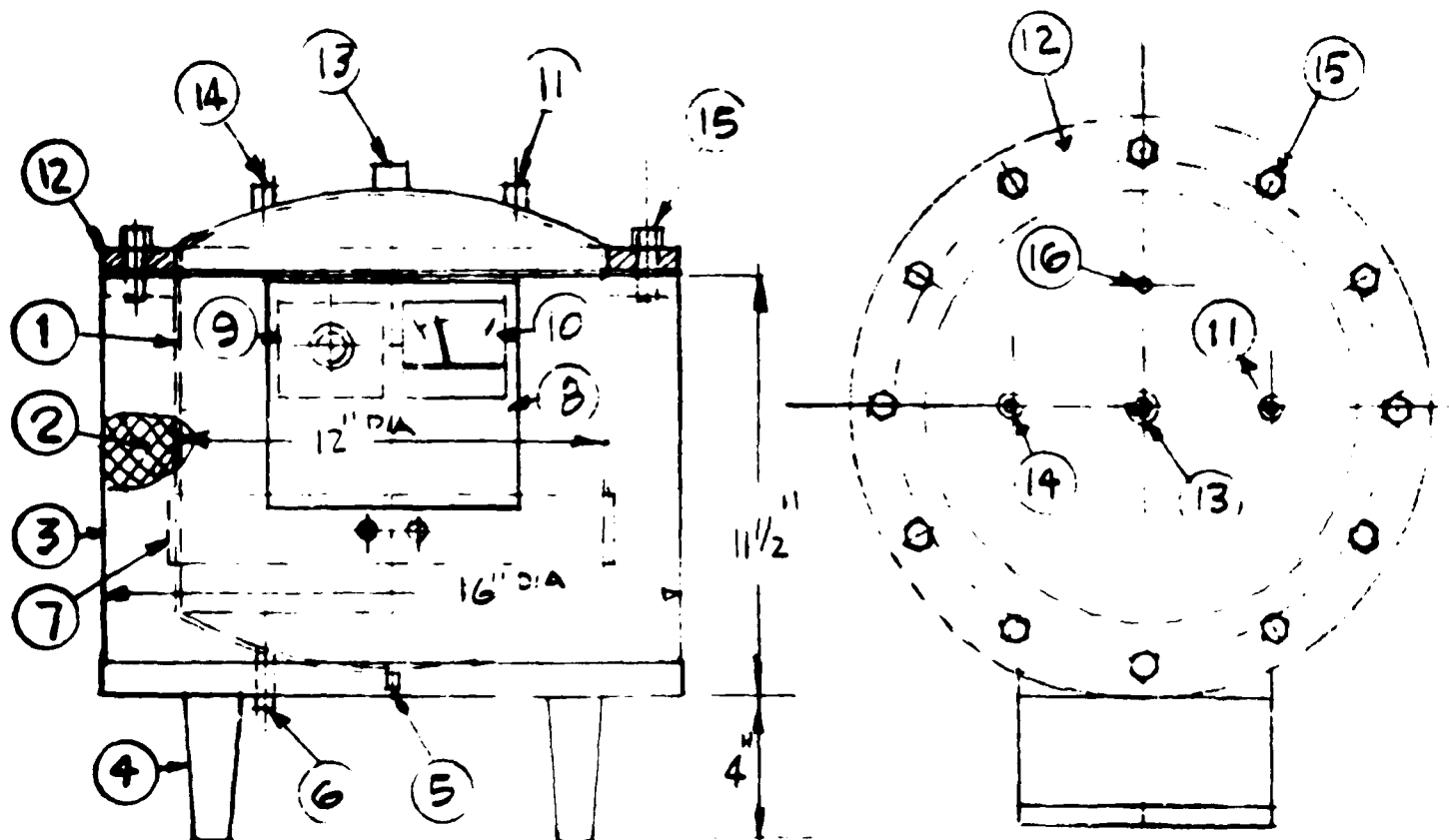
ELECTRICALLY HEATED TANK  
5 GALLON CAPACITY

ALL WETTED SURFACES TYPE 316 SS  
500 WATTS 120-1-60 HZ

THE ELECTRIC HEATER CO.  
STRATFORD, CONN

2 REQ'D

PLUG. NO. 78-2087-1



PC No	LIST OF PARTS	SIZE
1	TANK- STAINLESS STEEL TYPE 316	5 GAL CAP
2	FIBERGLASS INSULATION 2" THICK	
3	CASING STEEL	
4	LEG ADJUSTABLE 4"	
5	THERMISTER PROBE	1/4" IPS
6	OUTLET NIPPLE	1/2" IPS
7	HEATER ELEMENT	HBT-120
8	ENCLOSURE NEMA 1	
9	CONTROLLER	SERIES 194
10	METER - INDICATING	
11	FILL - COUPLING	1/2" IPS
12	FLANGE - REMOVABLE	
13	COUPLING - AGITATOR	3/4" IPS
14	COUPLING - RELIEF VALVE	1/2" IPS
15	BOLTS	3/8-16 x 1"
16	COUPLING - N2	3/8" IPS

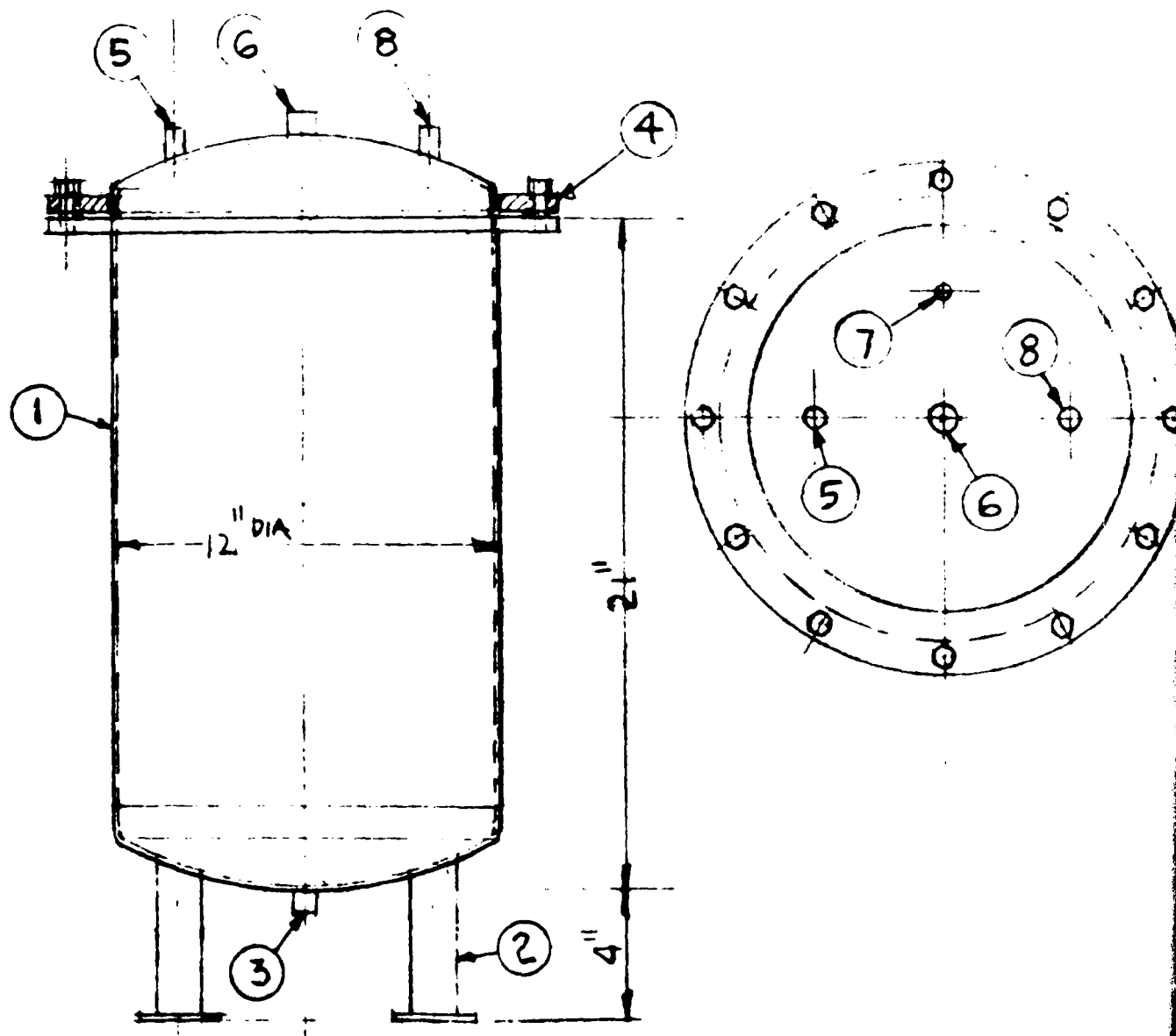
Figure 4

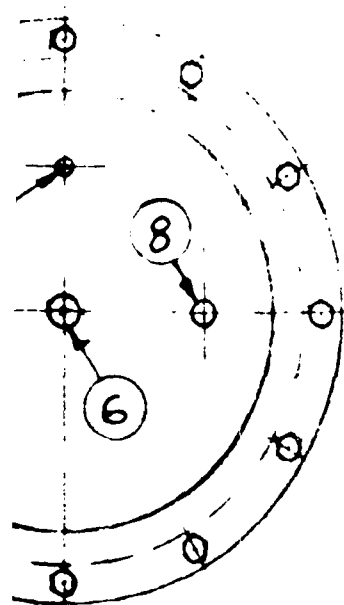
ELECTRICALLY HEATED TANK  
 5 GALLON CAPACITY  
 REMOVABLE TOP  
 ALL WETTED SURFACES TYPE 316SS  
 500 WATTS 120-1-60 HZ  
 THE ELECTRIC HEATER CO.  
 STRATFORD, CONN.  
 2 REQ'D DWG NO 78-2087-2

tanks that are electrically heated and have a propeller-type agitator. The tanks can be pressurized to 15 psi and are equipped with a safety valve and bottom outlet. The blowing agent mix tank is a one-gallon tank that is cooled by its self-contained refrigerant system. It has a propeller-type agitator and can be pressurized to 15 psi for fluid transfer through the bottom drain.

The mixing tank for the outer skin "A" component is a 10-gallon (37.8-liter) tank (Figure 5) and is equipped with propeller-type agitator. The "B" component must be mixed in two stages. Two individual mixes are made in the 5-gallon (18.9-liter) tanks, (Figure 6). These are then combined in a 10-gallon (37.8-liter) tank, (Figure 5) for final mixing. All tanks can be pressurized to 15 psi and are equipped with a safety valve and bottom drain.

A melting tank, (Figure 7) capable of holding two five-gallon pails is used to warm compound that is a solid at room temperature. This rectangular tank is equipped with a circulating pump and heat exchanger that allows water to be circulated through the tank and controlled at 150<sup>o</sup> F (65.6<sup>o</sup> C). A hinged lid allows easy access for placing containers in the tank for melt down.

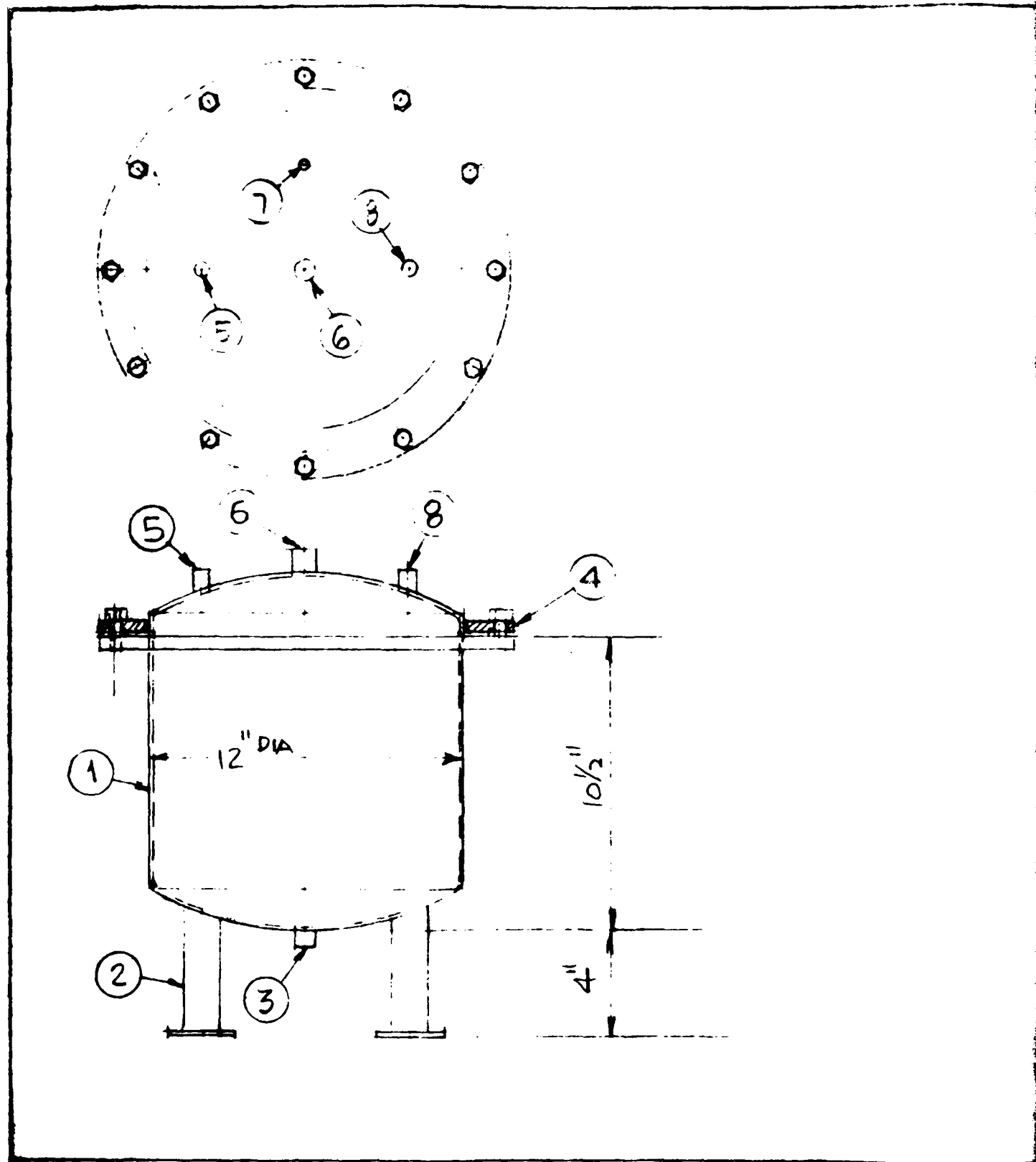




P. No	LIST OF PARTS	SIZE
1	TANK - STAINLESS STEEL TYPE 316	10 GAL CAP
2	LEG	
3	OUTLET - COUPLING	1/2" IPS
4	FLANGE	
5	COUPLING - RELIEF VALVE	1/2" IPS
6	COUPLING - AGITATOR	3/4" IPS
7	COUPLING N2	3/8" IPS
8	COUPLING - FILL	1/2" IPS

FIGURE 5

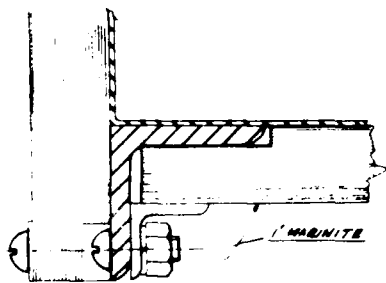
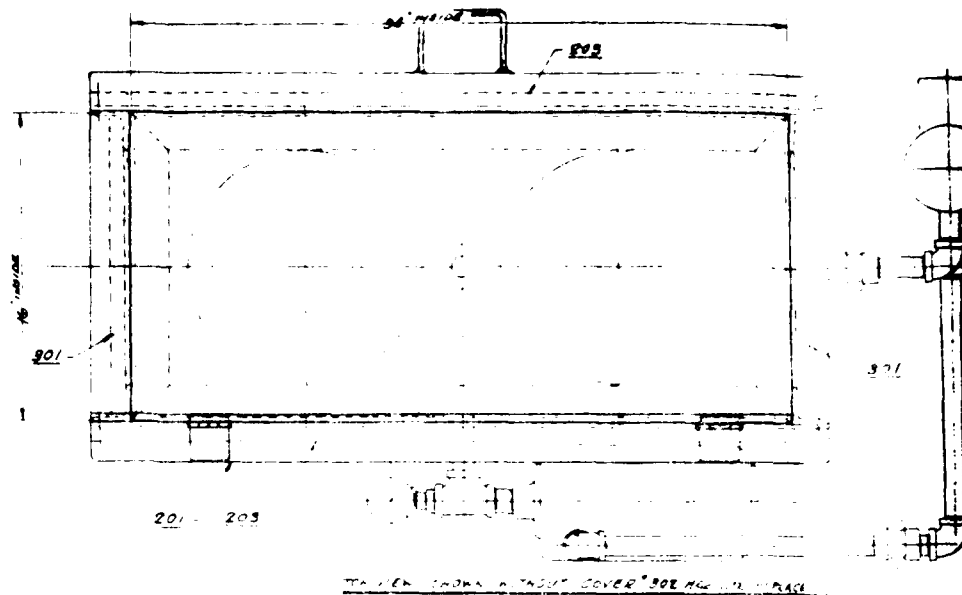
STORAGE TANK 10 GALLON CAPACITY ALL WETTED SURFACES TYPE 316 SS	
THE ELECTRIC HEATER CO. STRATFORD, CONN.	
(2) Req	DWG NO 78-2087-3



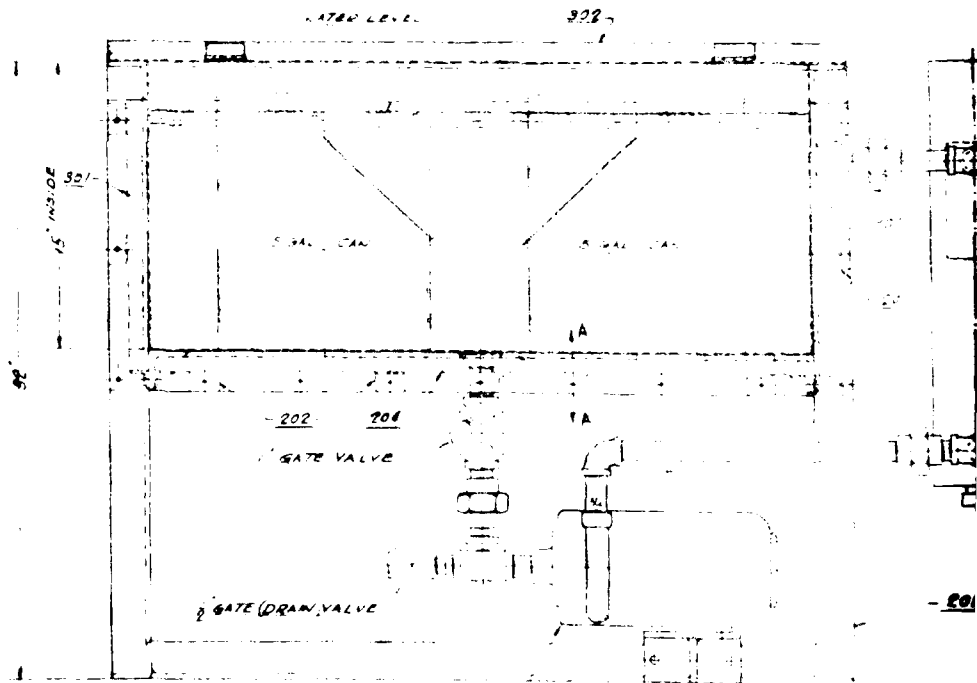
R.No.	LIST OF PARTS	SIZE
1	TANK - STAINLESS STEEL TYPE 316	5 GAL. CAP.
2	LEG	
3	OUTLET - COUPLING	1/2" IPS
4	FLANGE	
5	COUPLING - RELIEF VALVE	1/2" IPS
6	COUPLING - AGITATOR	3/4" IPS
7	COUPLING N <sub>2</sub>	3/8" IPS
8	COUPLING - FILL	1/2" IPS

Figure 6

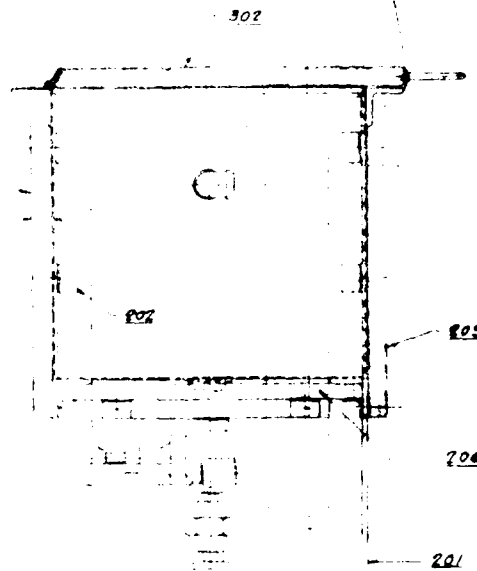
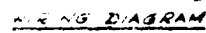
STORAGE TANK 5 GALLON CAPACITY	
ALL WETTED SURFACES TYPE 316 SS	
THE ELECTRIC HEATER CO. STRATFORD, CONN.	
2 Reg	DWG NO. TB-2087-4




SECT. A-A



101  
 DECOR CO. L.L.C. 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.



		<b>UNIROYAL, Inc.</b> ENGINEERING DEPARTMENT ANALYTICAL SERVICES GROUP MAINTENANCE RECORDS GROUP	
10-11-68 10:11 AM 10:11 AM			
10-11-68 10:11 AM 10:11 AM			
10-11-68 10:11 AM 10:11 AM			
DATE BY: 10-11-68		MADE BY: 10-11-68	
DATE: 10-11-68		APPROVED BY: 10-11-68	
SCALE 3" = 1 FT		SHEET NO. 1	
DWG NO		D-2287	

B. Compound Formulation

1. Upper Formula

(a) <u>Ingredients</u>	<u>Equivalents</u>	<u>Parts</u>
PTMG (2,000 Mol Wt.) (Resin)	0.100	100.0
1,4-Butanediol (Chain Extender)	0.1511	6.8
TMP (Cross Linker)	0.0266	1.2
MDI (Isocyanate)	0.2824	35.3
DC-193 (Silicone Surfactant)		0.64
T-12 (Tin Catalyst)		0.02
Lucel-4 (Azo Blowing Agent)		5.1
Cresyl Diphenyl Phosphate (Plasticizer)		12.1
90PC02 Black Pigment (Pigment)		<u>1.1</u>
		165.56
(b) <u>"A" Component (Prepolymer)</u>		
PTMG (10% NCO) (Prepolymer)		59.8
MDI (Isocyanate)		<u>35.3</u>
		95.1
(c) <u>"B" Component (Hardener)</u>		
PTMG (Resin)		40.2
1,4-Butanediol (Chain Extender)		6.8
TMP (Cross Linker)		1.2
DC-193 (Silicone Surfactant)		0.64
T-12 (Tin Catalyst)		<u>0.02</u>
		48.86
(d) <u>"C" Component</u>		
Lucel-4 (Azo Blowing Agent)		5.1
Cresyl Diphenyl Phosphate (Plasticizer)		12.4
90PC02 Black Pigment (Pigment)		<u>1.1</u>
		18.6

This foam compound is run at a 1.02-isocyanate index based on the following equation:

$$\text{Isocyanate Index} = \frac{\text{Number of equivalents of MDI}}{\text{Number of equivalents of (PTMG, 1,4-BD, TMP)}}$$

## 2. Outsole Formula

<u>(a) Ingredients</u>	<u>Equivalents</u>	<u>Parts</u>
PTMG (2,000 Mol. Wt.) (Resin)	0.0991	100.0
1,4-Butanediol (Chain Extender)	0.2000	9.0
Water	0.0333	0.3
MDI (Isocyanate)	0.3300	41.2
DC-193 (Silicone)		0.21
Dabco WT (Catalyst)		0.05
90PC02 (Pigment)		1.12
T-12 (Catalyst)		0.005
		<hr/> 151.885

### (b) "A" Component

PTMG (15% NCO)	(Prepolymer)	40.2
MDI	(Isocyanate)	<u>41.2</u>
		81.4

### (c) "B" Component (Hardener)

PTMG	(Resin)	59.800
1,4-Butanediol	(Chain Extender)	9.000
Water		0.300
DC-193	(Silicone Surfactant)	0.210
Dabco WT	(Catalyst)	0.050
90PC02	(Pigment)	1.120
T-12	(Tin Catalyst)	<u>0.005</u>
		70.485

The foam is run at a 0.99 isocyanate index based on the following equation:

$$\text{Isocyanate Index} = \frac{\text{Number of equivalents of MDI}}{\text{Number of equivalents of (PTMG, 1,4-BD, TMP)}}$$

## 3. Outer Coating Formula

### (a) "A" Component

B-602	(Urethane Prepolymer)	1700
Perchloroethylene	(Solvent)	1300
THF	(Solvent)	466.6

(b) <u>"B" Component</u>	<u>Parts</u>
(1) (B-1)	
MDA (Curing Agent)	400
THF (Solvent)	1000
CT-Black (Pigment)	20
(2) (B-2)	
B-602 (Urethane Prepolymer)	400
DIBK (Solvent)	300
THF (Solvent)	500

Weighing and mixing of "A" and "B" components must be done with properly grounded, explosion-proof equipment where dictated by safe handling procedures for flammable solvents. Adequate ventilation must also be provided.

#### C. Mixing Procedure

##### 1. Upper Formulation

###### (a) Prepolymer

Place 5-gallon (18.9-liter) pail of 10% NCO PTMG prepolymer into 150 F (65.6 C) hot water bath, (Figure 7). When the prepolymer is melted, empty the 5-gallon (18.9-liter) pail into the 5-gallon (18.9-liter) upper component "A" mixing tank, (Figure 4), and cap the tank with dry nitrogen. Set tank temperature control to 220 F (104 C) and turn on tank agitator. When the prepolymer reaches 220 F (104 C), continue to agitate for 15 minutes. The prepolymer is now ready for use.

(b) Hardener

Draw off necessary amount of melted PTMG from drum in storage oven 120 F (48.9 C) and place in 5-gallon (18.9 liter) upper component "B" mixing tank, (Figure 3), set at 150 F (65.6 C). Melt preweighed amount of TMP into 10% of the required 1,4-BD on a hot plate set at 150 F (65.6 C) and then add to the mixing tank. Weigh and add balance of 1,4-BD, DC-193, T-12 and 90PC02 into "B" component mixing tank. Raise mixing tank temperature to 220 F (104 C) and cap tank with dry nitrogen. When material temperature reaches set temperature continue to agitate for 45 minutes. Hardener is now ready for use.

(c) Blowing Agent

Set upper component "C" mixing tank temperature controller to 60 F (15.6 C). Weigh and add diphenyl phosphate into mixing tank. Remove Lucel-4 from freezer, weigh out required amount and add into mixing tank. Immediately return remainder of Lucel-4 to freezer. Turn on mixing tank agitator and cap tank with dry nitrogen. Agitate for 15 minutes at 60 F (15.6 C), then reset tank temperature controller to 50 F (10 C) and continue to agitate. When blowing agent compound reaches 50 F (10 C), it is ready for use.

## 2. Outsole Formulation

### (a) Prepolymer

Remove 5-gallon (18.9 liter) pail of 15% NCO, PTMG prepolymer from cold storage room and place into 150 °F (65.6 °C) hot water bath, (Figure 7). When the prepolymer is melted, empty the 5-gallon (18.9-liter) pail into the 5-gallon (18.9-liter) outsole component "A" mixing tank, (Figure 4), and cap tank with dry nitrogen. Set tank temperature controller to 165 °F (73.9 °C) and turn on agitator. When the prepolymer reaches 165 °F (74.9 °C) continue to agitate for 15 minutes. The prepolymer is now ready for use.

### (b) Hardener

Draw off necessary amount of melted PTMG from drum storage 120 °F (48.9 °C) and place in 5-gallon (18.9-liter) upper component "B" mixing tank, (Figure 3), set at 150 °F (65.6 °C). Melt preweighed amount of TMP into 10% of required 1,4-BD on a hot plate set at 150 °F (65.6 °C) and then add to mixing tank. Weigh and add balance of 1,4-BD, DC-193, T-12 and 90PC02 into "B" component mixing tank. Raise mixing tank temperature to 165 °F (73.9 °C) and cap tank with dry nitrogen. When material temperature reaches 165 °F (73.9 °C), continue to agitate for 45 minutes. The hardener is now ready for use.

### 3. Outer Coating

#### (a) "A" Component

Weigh and add the required amounts of THF and Perchloroethylene to the "A" component coating mixing tank, (Figure 5). Turn on the tank agitator. Draw off the necessary amount of melted B-602 from the drum in the storage oven and pour into mixing tank. Cap tank with dry nitrogen and mix for 30 minutes. The coating "A" component is now ready for use.

#### (b) "B-1" Component

Weigh and add the required amounts of MDA, THF, and CT-Black to the outer coating "B-1" component mixing tank, (Figure 6). Turn on tank agitator and blanket tank with dry nitrogen. Mix for 15 minutes.

#### (c) "B-2" Component

Weigh and add the required amounts of THF and DIBK to the outer coating "B-2" component mixing tank, (Figure 6). Turn on tank agitator. Draw off the necessary amount of melted B-602 from the drum in the storage oven and pour into the mixing tank, cap with dry nitrogen and mix for 30 minutes.

#### (d) "B" Component

After the "B-1" and "B-2" components are mixed, connect the transfer hoses between the outlet of the "B-1" and "B-2" tanks and the inlets of the "B" supply

tank, (Figure 5). Open the vent on the "B" tank and check to see that the agitators are operating in all tanks. Pressurize the "B-1" and "B-2" tanks to 5 psi with dry nitrogen. Open the outlet valve from the "B-1" tank and the inlet valve to the "B" tank, allowing the material in the "B-1" tank to flow to the "B" tank. After the material transfer is complete, close the inlet valve to the "B" tank, allowing the contents of the "B-2" tank to slowly transfer to the "B" tank. After material transfer is complete, close the "B-2" tank outlet valve and the "B" tank inlet valve. Shut off the nitrogen pressure to tanks "B-1" and "B-2". Cap the "B" tank with dry nitrogen and agitate for 30 minutes. The outer coating compound "B" component is now ready for use.

D. MATERIAL LISTING - CHEMICALS

MATERIAL

<u>(TRADE NAME)</u>	<u>CHEMICAL NAME</u>	<u>SOURCE</u>
Butanediol	1-4 Butanediol	GAF Corporation
Debco WT	Tertiary Amine Catalyst	Air Products & Chemical, Inc.
DC-193	Silicone Surfactant	Dow Corning Co.
DIBK	Diisobutyl Ketone	Eastman Chemical Co.
Lucel-4	AZO Foaming Agent	Lucidol Chemicals
MDA	Methylene Dianiline	Dow Chemical, Co.
MDI	Diphenylmethane Diisocyanate	Mobay Chemical Co.
MEK	Methyl Ethyl Ketone	Celanese Chemical Co.
Methylene Chloride	Methylene Chloride	Dow Chemical Co.
Microlith Black CT	Black Pigment	Ciba Geigy
Nonsticken stoffe	Release Agent	Contour Chemical
90PC02 Black Pigment	Black Pigment Paste	Harwick Chemical Co.
Perchloroethylene	Tetrachloroethylene	Ashland Chemical
Polymeg 2000 (PTMG)	Poly Tetra Methylene Ether Glycol	Quaker Chemical Co.
Santicizer S-140	Cresyl Diphenyl Phosphate	Monsanto Chemical
Stapler Wax	Mixture of Waxes	H.F. Staples & Co.
T-12	DiButyl Tin Dilaurate	M & T Chemical, Inc.
Toluene	Toluene	American Cyanamid

MATERIAL (Continued)

<u>(TRADE NAME)</u>	<u>CHEMICAL NAME</u>	<u>SOURCE</u>
THF	Tetrahydrofuran	DuPont, Inc.
TMP	Tri Methylol Propane	Celanese Chemical Co.
Vibrathane B-602	Polyether, Urethane Prepolymer	UNIROYAL Chemical Division
Vythene	111 Trichloroethane	Dow Chemical

## E. TYPICAL CHEMICAL PROPERTIES

The following is a listing of the typical properties of the chemical used in the manufacturing of the lightweight insulated boots as supplied by the manufacturers.

### 1. 1-4 BUTANEDIOL - ANHYDROUS GRADE AS MANUFACTURED BY G.A.F. CORPORATION

Specific Gravity	1.012 to 1.016
Equivalent Weight	45
Purity (Minimum)	99.4%
Solidification Pt <sup>o</sup> C	19.3
Boiling Point	221 to 231 <sup>o</sup> C
Viscosity @ 25 <sup>o</sup> C	65 to 70 cps
Water Level	0.04%

### 2. DABCO WT AS MANUFACTURED BY AIR PRODUCTS AND CHEMICALS

Color	Amber
pH (2% aqueous solution)	4.5 + 0.03
Water Level Maximum	3.7%—
Viscosity @ 23 <sup>o</sup> C	165 + 15 cps
Flash Point	129 <sup>o</sup> C
Pour Point	-37 <sup>o</sup> C
Specific Gravity	1.167

### 3. DC-193 AS MANUFACTURED BY DOW CORNING

Viscosity @ 25 <sup>o</sup> C	465 cps
Specific Gravity @ 25 <sup>o</sup> C	1.07
Refractive Index @ 25 <sup>o</sup> C	1.4515
Color - Gardner	2
Flash Point - Open Cup	204 <sup>o</sup> C

### 4. DIISOBUTYL KETONE AS MANUFACTURED BY EASTMAN CHEMICAL Company

Specific Gravity @20 <sup>o</sup> C	0.807 to 0.814
Boiling Range (760mm):	Initial 163 <sup>o</sup> C
	Dry Point 173 <sup>o</sup> C

Flash Point	TAG Closed cup	49°C
	TAG Open cup	55°C

Refractive Index	1,4230
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5. LUCEL -4 AS MANUFACTURED BY LUCIDOL CHEMICALS  
(See Section XI),

Assay	90% min.
Form	Liquid
Color	Liquid Yellow
Freezing Point	<-78°C
Specific Gravity @ 20°C	0.86
Seta Flash Point (ASTM D-3243-73)	<25°C

6. MEK AS MANUFACTURED BY CELANESE CHEMICAL COMPANY

Boiling Point	77°C to 82°C
Weight	6.95 lb/gallon (834 gm/liter)
Molecular Weight	72.1
Specific Gravity	0.805
Flash Point - Closed cup	1.1°C

7. METHYLENE DIANILINE AS MANUFACTURED BY METHESON,  
COLEMAN, AND BELL

Formula Weight	198.2
Melting Point	90°C to 92°C

8. DIPHENYL METHANE DIISOCYANATE AS MANUFACTURED BY  
MOBAY CHEMICAL COMPANY

Isocyanate Equivalent	125.5
NCO Content by Weight	33.4%
Acidity, as HCL	0.003%
Viscosity @ 43°C	5 cps
Molecular Weight	250
Specific Gravity @ 43°C	1.225

9. 90PC02 BLACK PIGMENT AS MANUFACTURED BY HARWICK  
CHEMICAL COMPANY

Pigment	7.8%
Dioctyl Phthalate	51.7%
Paraplex G-50	40.5%
Weight/Gallon	8.78 lbs.(5.1 kg/liter)
Specific Gravity	1.05

10. PERCHLOROETHYLENE AS MANUFACTURED BY ASHLAND CHEMICAL

Specific Gravity	1.627
Distillation Range (°C)	2.0 max. including 121.0
Flash Point	None
Refractive Index @ 25°C	1.503

11. POLYMEG 2000 (PTMG) AS MANUFACTURED BY QUAKER CHEMICAL COMPANY

Molecular WT	2000 $\pm$ 100
OH Number	53-59
Acid Number	0.05 maximum
Moisture %	0.03 maximum
Volatiles %	0.10 maximum
APHA Color	90

12. PTMG UPPER PREPOLYMER AS MANUFACTURED BY UNIROYAL, INC.

Percent Free NCO	10.0 $\pm$ 0.2
Amine Equivalent	412 to 428
Specific Gravity	1.09

13. PTMG OUTSOLE PREPOLYMER AS MANUFACTURED BY UNIROYAL, INC.

Percent Free NCO	15.0 $\pm$ 0.2
Amine Equivalent	276 to 283
Specific Gravity	1.10

14. SANTICIZER S-140 AS MANUFACTURED BY MONSANTO CHEMICAL COMPANY

Specific Gravity	1.197 to 1.207
Acidity (Meq/100 gm)	0.20 Maximum

Molecular Weight	340
Moisture (KF in Methanol)	0.15% maximum
Crystallizing Point	<(-15°C
Viscosity @ 25°C	33.0 cps

15. T-12 AS MANUFACTURED BY M & T CHEMICAL COMPANY

Specific Gravity	1.05
Pour Point	> 20°C
Acid Number	176
Tin Content	18.6%

16. THF AS MANUFACTURED BY DUPONT, INC.

Specific Gravity 20°C	0.886 to 0.889
Color-Not Darker than APHA	20
Water	0.03%
Peroxide by Weight (calculated as THF Hydroperoxide)	0.015%
Total Impurities by Weight	0.05%
Individual Impurities by Weight	0.02%
Stablizer by Weight	0.025 to 0.04%

17. TMP AS MANUFACTURED BY CELANESE CORPORATION

Trimethylol Propane by Weight	98.0%
Hydroxyl Content by Weight	37.5\$ min.
Water Content by Weight	0.05%
Acidity as Formic Acid by Weight	0.002% max.
Phthalic Color - Gardner	1 max.

18. TOLUENE AS MANUFACTURED BY AMERICAN CYANAMID, INC.

Molecular Weight	92.13
Specific Gravity	0.866
Flash Point: Open Cup	7.2°C
Closed Cup	4.4°C

19. VIBRATHANE B-602 AS MANUFACTURED BY UNIROYAL, INC.

Percent Free NCO	2.95 to 3.15
AMINE Equivalent	1355 ± 65
Viscosity @ 70°C	20 Poise
Specific Gravity	1.04

Nonstickenstoffe release agent and Stapler Wax are commercial preparations with no typical chemical properties available. Methylene Chloride and Vythene are commercial cleaning solvents and thus no typical chemical properties are listed. No information on the Microlith Black CT pigment is available.

F. LUCEL-4 SPECIAL HANDLING, STORAGE AND SAFETY REQUIREMENTS

1. SOLUBILITY

LUCEL-4 is very soluble in most organic solvents. It decomposes in acidic solvents.

2. HANDLING

LUCEL-4 is intended for industrial use only. It should be handled with care. All persons who handle LUCEL-4 should be thoroughly familiar with the following information.

3. FLAMMABILITY

LUCEL-4 is easily ignited and burns vigorously. It must be kept away from all sources of heat and ignition such as radiators, steam pipes, direct sunlight, open flames, and sparks. In the event of fire, wear self-contained breathing apparatus.

Suitable extinguishers for fighting a LUCEL-4 fire are dry chemical, foam, or carbon dioxide. If the fire is extensive, deluge with water and evacuate the area. If a fire occurs near LUCEL-4, wet the containers with water to prevent overheating.

4. STORAGE

LUCEL-4 should be stored by itself, away from other acidic or combustible materials. LUCEL-4 is extremely sensitive to mineral and organic acids. Acid contamination or exposure to temperatures above 115°F (46°C) causes vigorous decomposition with the release of nitrogen gas and flammable vapors which may self-ignite.

Although LUCEL-4 can be handled at room temperatures for short periods of time, it is recommended that it be stored below 0°F to obtain the best shelf life (prevent assay loss). It is stabilized with triethylamine. Solids may be present due to the stabilizer. Significant solids may indicate loss of stabilizer and possible low assay substantial loss of stabilizer can cause a more rapid rate of assay loss.

LUCEL-4 and all dilutions of LUCEL-4 should be stored with vented caps to prevent pressure buildup. Use only clean polyethylene containers for dilution and storage of dilutions and avoid all sources of contamination such as rust, dirt, and acidic materials.

Storage areas should be selected in accordance with local laws and regulations and subject to the approval of the insurance carrier.

## 5. SPILLAGE AND DISPOSAL

LUCEL-4 is volatile and in a confined or non-ventilated area a lethal concentration of vapor may result from a spill or leak, especially at room temperature.

In order to properly clean up spillage, a supply of inert, non-combustible absorbent should be kept on hand in the area where LUCEL-4 is handled. Only VERMICULITE and PERLITE have been found to be satisfactory.

Personal dealing with the clean-up of spills should wear a gas mask (organic vapor canister) or use a self-contained breathing apparatus (SCBA) and protective equipment, including rubber gloves. Gas masks are generally suitable for use in ventilated areas but should never be used in confined areas. In confined areas where oxygen deficiency and high vapor concentration may occur, use a self-contained breathing apparatus.

If spillage occurs, immediately cover the spill with an excess of VERMICULITE or PERLITE only. Using breathing protection, sweep up the absorbed material and dispose of it at once. Depending upon local, state, or federal regulations the contaminated absorbed material can be disposed of by burning, burying, or hydrolysis with acid. Burning may be accomplished by placing in a shallow trench and igniting, from a safe distance, with a torch about 6 feet long.

If space is available the sweepings may be buried. The LUCEL-4 will gradually decompose.

The LUCEL-4 in the absorbent material may also be destroyed by hydrolysis with dilute mineral acid. The absorbed material should be wetted with water and then added slowly with stirring to an excess of a 5-10% aqueous sulfuric or hydrochloric acid solution. On decomposition, some of the products are flammable, so due precaution should be taken to provide proper ventilation and to prevent any sources of ignition.

If any problems arise contact the manufacturer for instructions.

## TOXICITY

Acute inhalation toxicity studies in rats have shown the LD<sub>50</sub> to be 4.4 mg/l (683 ppm v/v) for a 1-hour exposure.

The equilibrium vapor concentration of LUCCEL-4 in a closed system at 25°C (77°F) was determined to be 20.4 mg/l (3151 ppm v/v). This means that in a closed area without ventilation, a lethal concentration of vapors could occur if a sufficient amount of LUCCEL-4 has leaked or spilled, and sufficient time has elapsed. LUCCEL-4 has an evaporation rate slightly lower than that of styrene monomer.

Acute oral toxicity studies in rats have shown the LD<sub>50</sub> to be 228 mg/kg of body weight.

Acute dermal toxicity studies in albino rabbits have shown the LD<sub>50</sub> to be 176.8 mg/kg of body weight for LUCCEL-4.

Based upon the above data, LUCCEL-4 should be considered highly toxic if absorbed through the skin and toxic if inhaled or swallowed. Personnel should avoid inhalation of LUCCEL-4 vapors or vapors from any spillage. Care should be taken to avoid skin contact. Rubber gloves should be worn when handling LUCCEL-4.

Do not take internally.

In case of contact immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. If soap is available, use it also to wash skin. Get medical attention. Wash clothing before re-use. Discard contaminated shoes.

If inhaled remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, give large quantities of milk or water. Get immediate medical attention for lavage. Do not induce vomiting. Do not give an unconscious person anything by mouth.

# G. CHEMICAL STORAGE REQUIREMENTS

<u>CHEMICAL</u>	<u>STORAGE REQUIREMENTS</u>	<u>CONTAINER SIZE</u>	<u>COMMENTS</u>
1. Butanediol	Store at room temp.	55-gal drum	Protect from exposure to moisture
2. Dabco WT	Store at room temp.	10-lb. container	Protect from exposure to moisture
3. DC-193	Store at room temp.	5-gal pail	Protect from exposure to moisture
4. DIBK	Store at room temp.	55-gal drum	Protect from exposure to moisture
5. LUCCEL-4	Store at 0°F (-18°C)	1-gal can	See LUCCEL special instructions Section XI
6. <u>MDA</u>	Store at room temp.	25-lb fiber container	Protect from exposure to moisture
7. MEK	Store at room temp.	55-gal drum	NFPA No. 30 flammable & combustible liquids code applies
8. Methylene Chloride	Store at room temp.	55-gal drum	Protect from exposure to moisture
9. Microlith Black Ct.	Store at room temp.	5-gal pail	---
10. Nonstickenstoffe	Store at room temp.	16-oz. can	---
11. 90 PC02 Black Pigment	Store at room temp.	5-gal pail	---
12. Perchloroethylene	Store at room temp.	55-gal drum	Protect from exposure to moisture
13. Polymeg 2000 (PTMG)	Store below 100°F (38°C)	55-gal drum	Protect from exposure to moisture
14. Polymeg 2000 MDI Prepolymers	Store at 45 ± 5°F (6.7 ± 2.8°C)	5-gal pail	Protect from exposure to moisture
15. Santicizer S-140	Store at room temp.	55-gal drum	---

<u>CHEMICAL</u>	<u>STORAGE REQUIREMENTS</u>	<u>CONTAINER SIZE</u>	<u>COMMENTS</u>
16. Stapler Wax	Store at room temp.	1-lb can	---
17. T-12	Store at room temp.	1-gal pail	Protect from exposure to moisture
18. Toluene	Store at room temp.	55-gal drum	NFPA No. 30 flammable and combustible liquids code applies
19. THF	Store at room temp.	55-gal drum	NFPA No. 30 flammable and combustible liquids code applies
20. TMP	Store at room temp.	50-lb bag	Protect from exposure to moisture
21. Vibrathane B-602	Store at $75 \pm 5^{\circ}\text{F}$ ( $24 \pm 2.8^{\circ}\text{C}$ )	55-gal drum	Protect from exposure to moisture
22. Vythene	Store at room temp.	55-gal drum	---

Note:

1. All materials must be protected against exposure to moisture. Containers being used must have dryer tubes in vent hole and positive shutoff drain valves. If containers are opened and then closed after withdrawing material, the container must be blanketed with nitrogen.
2. Solvent storage must meet the recommendations of NFPA No. 30 "Flammable and Combustible Liquids Code".
3. When handling solvents, local or general, exhaust ventilation should be used to maintain solvent vapor concentrations below the explosive limit and the threshold limit values. Contact with skin and eyes should be avoided.

#### H. IN-PROCESS CHEMICAL STORAGE REQUIREMENTS

<u>Chemical</u>	<u>In-Process Storage Requirements</u>	<u>Container Size</u>	<u>Amount Stored</u>
1. Polymeg 2000 MDI Prepolymer- 15% NCO	150°F (65.6°C) water bath	5-gal pail	One 5-gal pail
2. Polymeg 2000 MDI Prepolymer- 10% NCO	150°F (65.6°C) water bath	5-gal pail	One 5-gal pail
3. Polymeg 2000	120°F (48.9°C) Storage Oven	55-gal drum	Two 55-gal drums
4. Vibrathane B-602	120°F (48.9°C) Storage Oven	55-gal drum	Two 55-gal drums

### III. LEGLINING AND SNOW COLLAR PREPARATION

#### A. Stitching and Eyeletting Equipment

##### 1. Leglining Equipment (Figure 8)

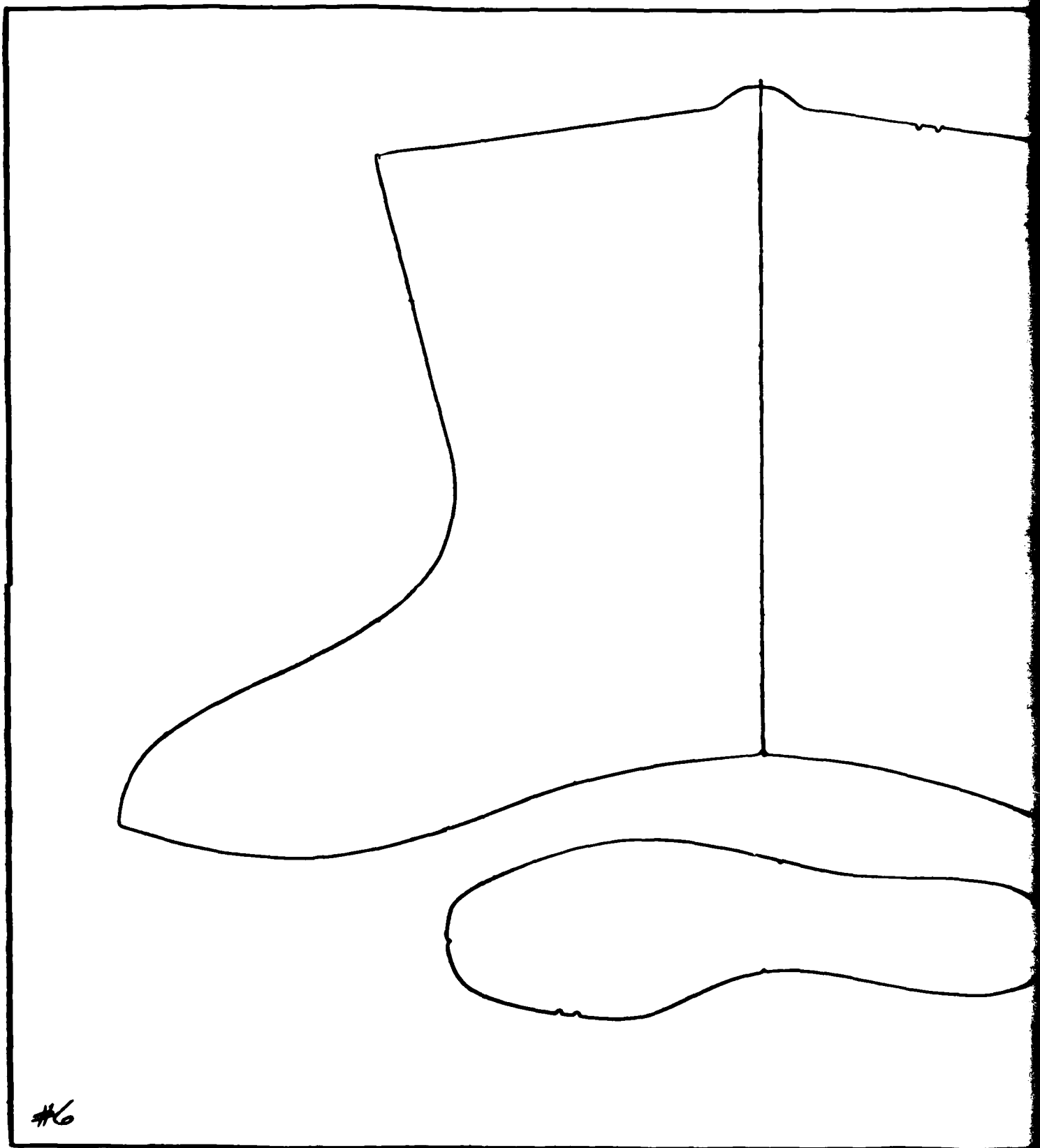
- (a) Close Stitch Leglining - Merrow Stitcher Style  
Front of Leg A-3-3
- (b) Close Stitch Leglining - Merrow Stitcher Style  
Bottom of Leg A-3-3

##### 2. Collar Equipment (Figure 9)

- (a) Seam Collars - Singer 138 WSV7 Post  
Seamer or Singer 168  
WSV7 Post Seamer
- (b) Eyelet Collars - U.S.M. Model "B" Eyelet  
Machine with telescopic  
hopper
- (c) Stitch Collar to - Ozan Overedge Stitching  
Boot (Inside) Machine
- (d) Stitch Collar to - Singer 107 W50 Zig-Zag  
Outside of Boot Sewing Machine
- (e) Bar Tack Collar to - Singer 269 Bar  
Boot Tacker

#### B. Socklining/Leglining Stitching Procedure

The boot leglining and socklining are made of 1830/1 black, urethane coated nylon tricot weighing 4.8 + 0.5 - 0.3 ounces per square yard (162 + 17 grams per - 10.2 square meter). These parts are clicker cut from roll stock using dies graded from the size 10R cutting pattern. The leglining will be folded and the front seam edge closed, using a merrow style A-3-3 stitch, (Figure 10) using a loose thread tension at eight stitches per inch (2.54 cm). The proper sized socklining is then stitched to the bottom of the leglining, using a merrow style A-3-3 stitch, using a loose thread tension at eight



#6

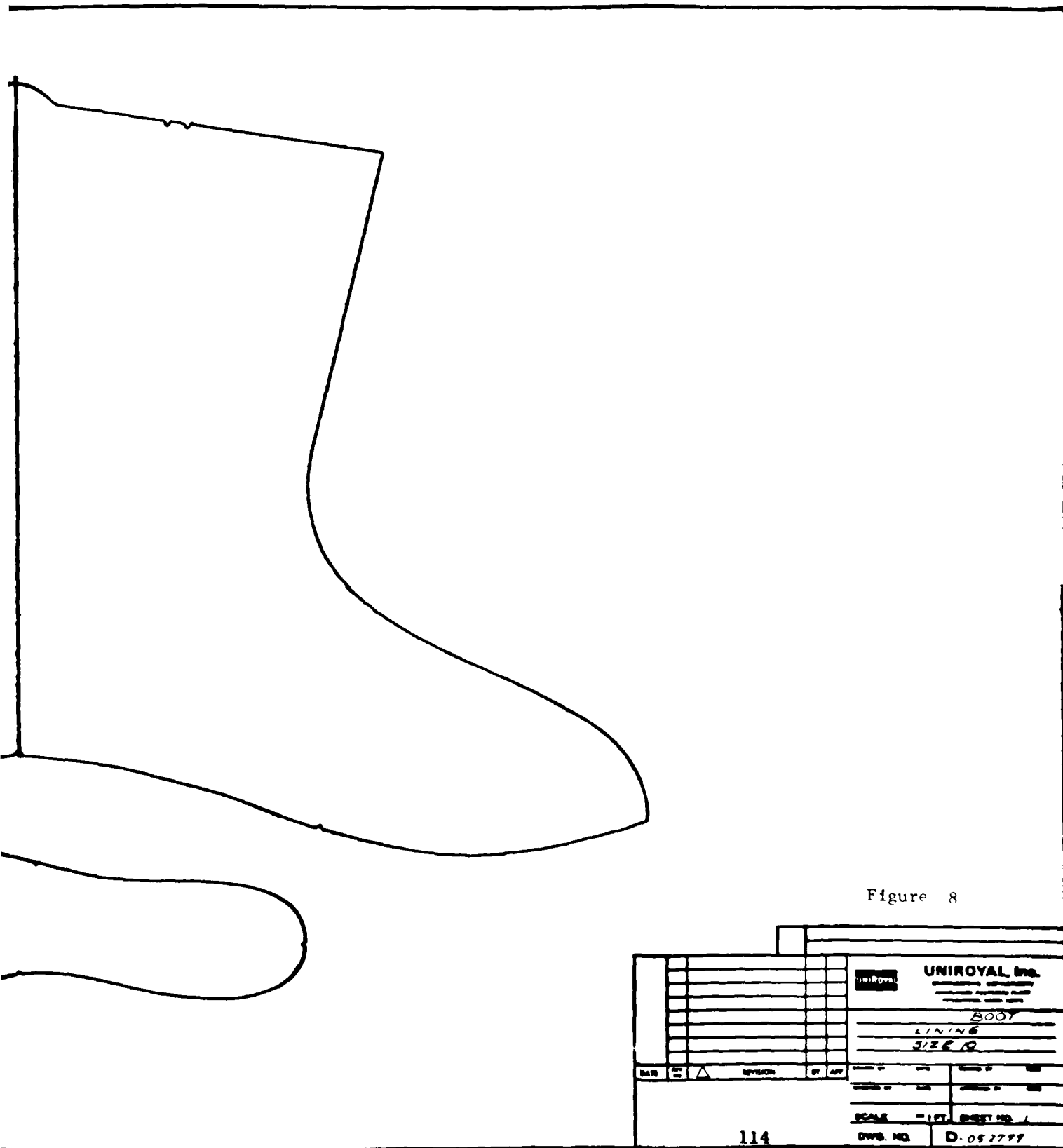


Figure 8

SIZE 10  
52 LAST  
MENS

→ STAB  
MAKE BRACE FLUSH  
WITH STRIKING SIDE

SELVAGE

COLLAR  
4/PR.

CLICKING DIE  
1/4" HIGH

886  
K

0  
ST

1R

G DIE  
SH

6

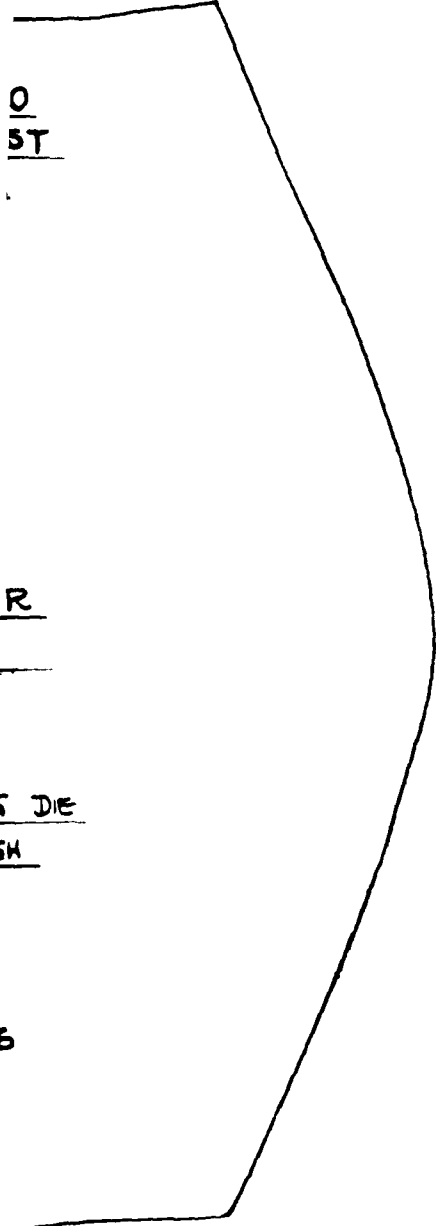



Figure 9

					<b>UNIROYAL, Inc.</b> ENGINEERING DEPARTMENT NAUGATUCK FOOTWEAR PLANT NAUGATUCK, CONN. 06770				
<b>INSULATED BOOT</b> <b>"SNOW COLLAR" CUTTING PATTERN</b>									
DRAWN BY TAW			DATE 8-30-77			APPROVED BY			DATE
SCALE			12" = 1 FT.			SHEET NO.			2
DWG. NO. D-052777									
DATE	REV.	NO.	REVISION	BY	APP.				

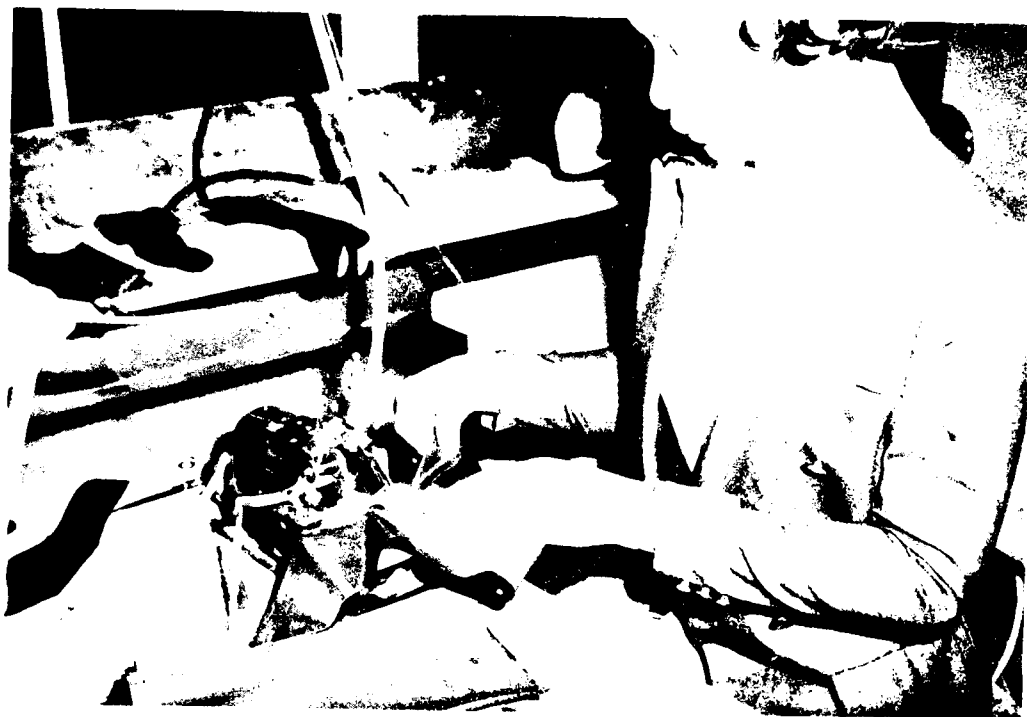


FIGURE NO. 10. MERROW STITCHER      STYLE - A-2-2

stitches per inch (2.54 cm). The coated side of the lining is to be placed to the inside of both parts. Number 69 black nylon thread is used in all sockliner/legliner stitching operations. (All material specifications are listed at the end of this section).

#### C. Collar Stitching Procedure

In the collar operation, the appropriate size collar is clicker cut from roll stock 1830/1 black, urethane coated nylon tricot weighing  $4.8 + 0.5$  ounces per square yard ( $162.8 + 17$  grams per square meter) using dies graded from the size 10R cutting pattern.

After cutting, the collar is eyeletted, centered to a die-cut location hole using a United Shoe Machine Model B eyeletter with washer-type eyelets. There are two eyelets and two washers per collar, and the eyelet must be on the nylon tricot. Each half collar must have the bottom of the collar turned  $\frac{1}{2}$ " (1.27cm) and single-needle stitched. With a one-half (side) part of the collar laid flat, nylon side up, the eyelet to the left, and size notches to the bottom, the contractual markings are to be stamped onto that part which is approximately 1" (2.54 cm) below the eyelet and centered within this area. White ink shall be used. With this side collar so stamped and placed, a mated side panel (not stamped) is placed over the first side, nylon-to-nylon. The curved side edges are then single needle lock-stitched together, using a Singer Model 168 post-seamer or similar machine. A stitching margin of  $\frac{1}{8}$ " (0.32 cm) and a setting of eight stitches per inch (2.54 cm) are to be maintained. With the eyelets centered to the front position and the collar backseam centered to the rear of the boot top, the inside bottom edge of the collar is then attached to the inside of the top edge of the boot, (Figure 11), with the



FIGURE NO. 11 OZAN OVEREDGE STITCHING MACHINE



FIGURE NO. 12 SINGER 107 W50 ZIG-ZAG SEWING MACHINE

inside edge of the collar overlapping the inside top edge of the boot with a 1/4" (0.635 cm) margin, using an Ozan Over-edge Sewing Machine, (Figure 12), set at six stitches per inch (2.54 cm). A 36-inch (91.44 cm). A 36-inch (91.44 cm) black tubular cotton lace with black acetate tip is inserted through the eyelet, looping it around the collar.

The top part of the collar is folded down overlapping the top outside edge of the boot by 3/4" (1.9 cm) and zig-zag stitched at six stitches per inch (2.54 cm) with a 1/8" (0.32 minimum 1/2" (1.27 cm) maximum stitching overlap using a Singer Model 107 W50 Sewing Machine. At the back seam of the collar, approximately 1" (2.54 cm) down from the folded top edge and lace, the collar is bar-tack stitched together, horizontally to the top edge for a distance of approximately 1" (2.53 cm), using a Singer Model 269 Bar Tacker Sewing Machine. Number 69 black nylon thread is used in all collar stitching operations.

#### D. Stitching Standards

##### 1. Leglining

Close stitch leglining - front - merrow stitch style A-3-3 - loose tension - eight stitches per inch (2.54 standard - ten stitches per inch (2.54 cm) minimum.

##### 2. Socklining

Close stitch leglining/socklining - merrow stitch style A-3-3 - loose tension - eight stitches per inch (2.54 cm) standard - ten stitches per inch (2.54 cm) maximum - six stitches per inch (2.54) minimum.

### 3. Collar

#### (a) Eyelet

Number 404 telescopic black enamelled aluminum eyelet - two per collar required.

#### (b) Collar seaming

Seam collar ends 1/8" (0.32 cm) - single-needle locksmith seam - eight stitches per inch (2.54 cm) - ten stitches per inch (2.54 cm) maximum - six stitches per inch (2.54 cm) minimum.

#### (c) Collar Attaching - Inside

Join collar inside bottom to boot inside top edge overlapping boot with 1/4" (0.635 cm) margin Ozan overedge type stitch - six stitches per inch (2.54 cm) standard - eight stitches per inch (2.54 cm) maximum - five stitches per inch (2.54 cm) minimum - over lap 1/8" (0.32 cm) minimum, 1/2" (1.27 cm) maximum.

#### (d) Collar Attaching - Outside

Join collar outside bottom to boot outside top edge overlapping boot with 1/2" (0.635 cm) margin - zig-zag lockstitch six stitches per inch (2.54 cm) standard - five stitches per inch (2.54 cm) minimum - eight stitches per inch (2.54 cm) maximum - 1/8" (0.32 cm) minimum stitching overlap - 1/2" (1.27 cm) maximum stitching overlap.

#### (e) Bar Tack Collar

Horizontal bar tack collar one inch (2.54 cm) below folded

top edge of collar - single needle lockstitch seam or bar  
tack seam one inch (2.54 cm) long.

(f) Thread

Number 69 black nylon thread to be used in all stitching  
operations.

E. LIST OF MATERIALS WITH PURCHASING SPECIFICATIONS

1. LACE  
Tubular Cotton, pressed flat  
Single end  
64 Braiders per inch (25.2 braiders per  
cm)  
22 Picks per inch (8.7 picks per cm)  
Size 20, 2-Ply Construction 2  
18.75 Gross Yards per lb (37.5 m /kg)  
112 lb minimum tensile (50.9 kg)  
Tips - 0.010 ga. (0.254 mm) Clear  
Acetate 5/8" (1.59 cm) long  
  
SOURCE: UNIROYAL, Inc., Naugatuck, CT.
2. EYELET  
Type: Telescopic with Roll Setting  
Barrel  
Material: 0.011-ga. Aluminum (0.28mm)  
Finish: Japaned Tumbled with Black  
Enamel  
Outside Diameter of Flange: 0.460"  $\pm$  0.006  
(12 mm  $\pm$  0.15)  
Outside Diameter of Barrel: 0.228"  $\pm$  0.003  
(5.8 mm  $\pm$  0.07)  
Overall Length: 0.195"  $\pm$  0.008  
(4.9 mm  $\pm$  0.2)  
  
SOURCE: Plymouth, Div. Emhart Corp. New Bedford,  
Massachusetts
3. WASHER  
Type: Telescopic with Barrel Set  
and Scored  
Material: 0.009" Aluminum (0.23 mm)  
Outside Diameter of Flange: 0.445"  $\pm$  0.006  
(11.3 mm  $\pm$  0.15)  
Outside Diameter of Barrel: 0.217"  $\pm$  0.004  
(5.5 mm  $\pm$  0.1)  
Overall Length: 0.140"  $\pm$  0.008 (3.6 mm 0.2)  
  
SOURCE: Plymouth Div. Emhart Corp. New Bedford  
Massachusetts

4. LASTING TAPE      Width: 1/2 inc (1.27 cm)  
                         Type: 3M Scotch Electric #29  
  
                 SOURCE: Minnesota Mining & Manufacturing Co.  
                                 St. Paul, MN
5. THREAD:      Nylon 69 Type II 3-ply Bonded  
                         Construction  
                         SIZE: E.  
                         Final Twist 5.0 Twists per inch  
                                         (2.54 cm) min.  
                         Length Per Lb (0.46 Kg): 5000 Yds  
                         (4572m)min.  
                         Breaking Strength:  
                                         8.5 lb (3.86 kg). Min.  
                         Class I Elongation: 22% of Maximum
- SOURCE: Threads, Inc. Lawrence Ma.
6. CHIPBOARD TUBE      0.040 ga. (1 mm) x 9" (23 cm) long  
                                 x 6" (15.2 cm) diam.  
  
                 SOURCE: Stonington Paper Tube Co., Inc.  
                                 East Hampton, MA.
7. PRINTED INSTRUCTION      6-1/2" (16.5 cm) x 5-1/2" (14 cm)  
                 TAG      folded to 3-1/4" (8.3 cm) x 5-1/2"  
                                 (14 cm) 3/8" (0.95 cm) hole in upper  
                                 left hand corner near fold, printed  
                                 on four pages (see user instruction  
                                 tag (page 171 Par. 6)  
  
                 SOURCE: Any local printing company.
8. WHITE TISSUE PAPER      15" (38 cm) x 24" (61 cm)  
  
                 SOURCE: Walker-Goulard-Telhn Co., New York  
                                                         N.Y.
9. CARTON      Plain Kraft, Printed Front Panel,  
                         Die-Cut, Self-Locking CF, SW, B Flute  
                         200-lb. Test (90 Kilos)  
                         I.D. 18-14" L (46.5 cm) x 11" W  
                         (28 cm) x 5-13/16" D (14.8 cm) 1/pr  
  
                 SOURCE: Allied Container Corp., Newtown, CT
10. WATER SENSITIVE GLUED      3" wide (7.6 cm), 60 lb,  
                 TAPE      (27 kilograms), 3" pr.  
  
                 SOURCE: Industrial Paper Co., Waterbury, CT

11. CASE

Plain Kraft, Printed Side Panel  
CF, RSC, SW, 275 Lb. Test (125 Kilos)  
Stitched Joint, Tab-Out  
I.D. 37" L (94 cm) 19-5/8" W  
(50 cm) x 11-1/4" D (28.5 cm)  
O. D. 37-1/4" L (94.5 cm) x 19-7/8" W  
(51 cm) x 12-18" D (31 cm) 5.2 cu ft.  
0.15 cu meters.

SOURCE: Allied Container Corp., Newtown, CT.

12. SOCKLINER, LEGLINER  
and COLLAR

The following are specifications  
recommended for the sockliner and  
collar. This is based primarily  
on data submitted by both Gehring  
Textile for the fabric and Reeves  
Brothers for the coated fabric.

<u>Physical Property</u>	<u>Test Method</u>	<u>Requirements</u>
Reeves Style (coated) Construction		A05-010-000-540 <sup>1</sup> Clear Polyether Polyurethane Coated Nylon Tricot
Weight (oz/sq yd)	FED-STD-191 (5041)	4.8 + 0.5 - 0.3 163 + 17 - 10 gm/sq m)
Width (inches)	FED-STD-191 (5020)	52 (132 cm)
Gauge (inches)	FED-STD-191 (5030)	0.012 min. (0.3 mm)
Breaking Str. (lb) Warp X Fill	FED-STD-191 (5100)	70 x 70 min. (312N x 312N)
Elongation at 10 lb. (%) Warp X Fill	FED-STD-191 (5100)	20 x 25 min.
Tear, Elmendorf, Grams	FED-STD-191 (5132)	1200 min. (11.8N)
Coating Adhesion, lb/inch Width	FED-STD-601 (8211)	4.0 min. (17 N/cm)
Air Retention (Porosity)	Reeves ten-inch (25.4-cm) diam. disc. with 1" (2.54-cm) inflation	No Leaks

<sup>1</sup>  
Uncoated Fabric is nylon tricot net (black) 2.4 oz/sq yd  
(81 g/sq m) 52" wide (132 cm) and count (Wales X Courses/inch)  
of 38 x 55 (min.) Gehring Textile Co. Style 4112M.

SOURCE: Reeves Brothers, Inc., New York, N.Y.

13. OUTSOLE SPRAY MASK

0.025" (0.64 mm) polyethylene sheet-  
sheet size to suit the type of thermo-  
former used.

SOURCE:

Cadillac Plastics Co., Detroit, MI

14. MARKING INK

Markem Ink 8272

SOURCE:

Markem Ink and Chemical Data,  
Keene, N. H.

#### IV. SPRAY MASK PREPARATION

##### A. Vac Forming Equipment

The equipment used for vacuum forming is an AmPac Model 4005W. It consists primarily of electrical rod type heaters, movable clamping frame and fixed vacuum table and instrumentation to control heat, dwell, and cooling cycle.

##### B. Forming Procedure

1. Cut polyethylene sheet (high density 0.035" (0.7mm) to size to fit clamping frame (20½" x 26½" (52.1 cm x 67.3 cm). (Cadillac Plastics, Hartford, CT.)
2. Place vacuum box and master form on vac former base plate.
3. Place sheet in clamping frame.
4. Heat sheet for 85 seconds with top heaters at 100% setting which gives a stock temperature of 195-200°F (90.6 - 93.3°C).
5. Vac form the sheet over the master form.
6. Cool the spray mask for 80 seconds.
7. Release vacuum and remove spray mask from unit and trim to desired shape.

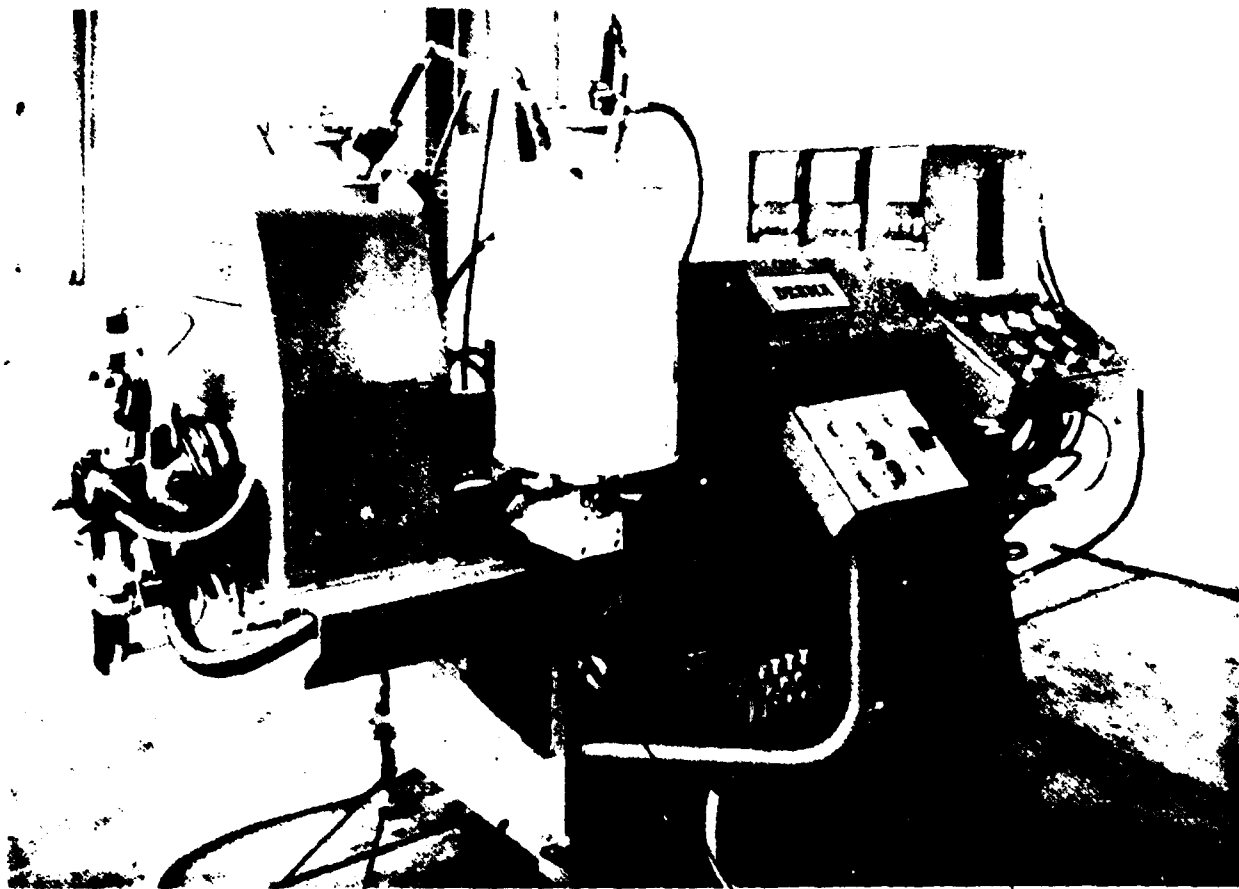
## V. FOAM MIXING AND MOLDING

### A. General Equipment Requirements

The urethane foam mixing unit (Desma PSA-73) (Figure 13) is designed as a three-component foam metering and mixing machine. It has a mixing capacity of 50 to 100 grams of compound per second throughput. The three ingredients are supplied to the mixing head (Figure 14) from the supply tanks by two 30-cc/rev gear pumps and by one 6-cc/rev pump (Figure 15). These pumps are driven by quick-change-ratio gears. (Figure 16) from a single electric motor. The on-off flow to the mixing head is controlled by three valves (Figure 17). The valves for the "A" and "B" component are actuator-type with the necessary controls for synchronization and lead-lag adjustment. Shot volume is controlled by means of an impulse counter. Mixing of the compound is accomplished by passing through a close tolerance mixing chamber (Figure 14) with a screw rotating at 18,000 RPM.

Compound supply tanks (Figure 18), compound hoses, pump blocks, and mixing head are equipped for heating/cooling as required to maintain proper material temperatures. All temperatures control units (Figure 19) are supplied with the unit.

All mixing equipment except the main electronic control cabinet (Figure 20) and the water chiller unit are mounted on a base platform that can be traversed forward and back so that the mixing head nozzle will make contact with the mold to be injected and then retract for cleaning.



505

506  
507

501

504

503

502

FIGURE NO. 13 FOAM INJECTION UNIT

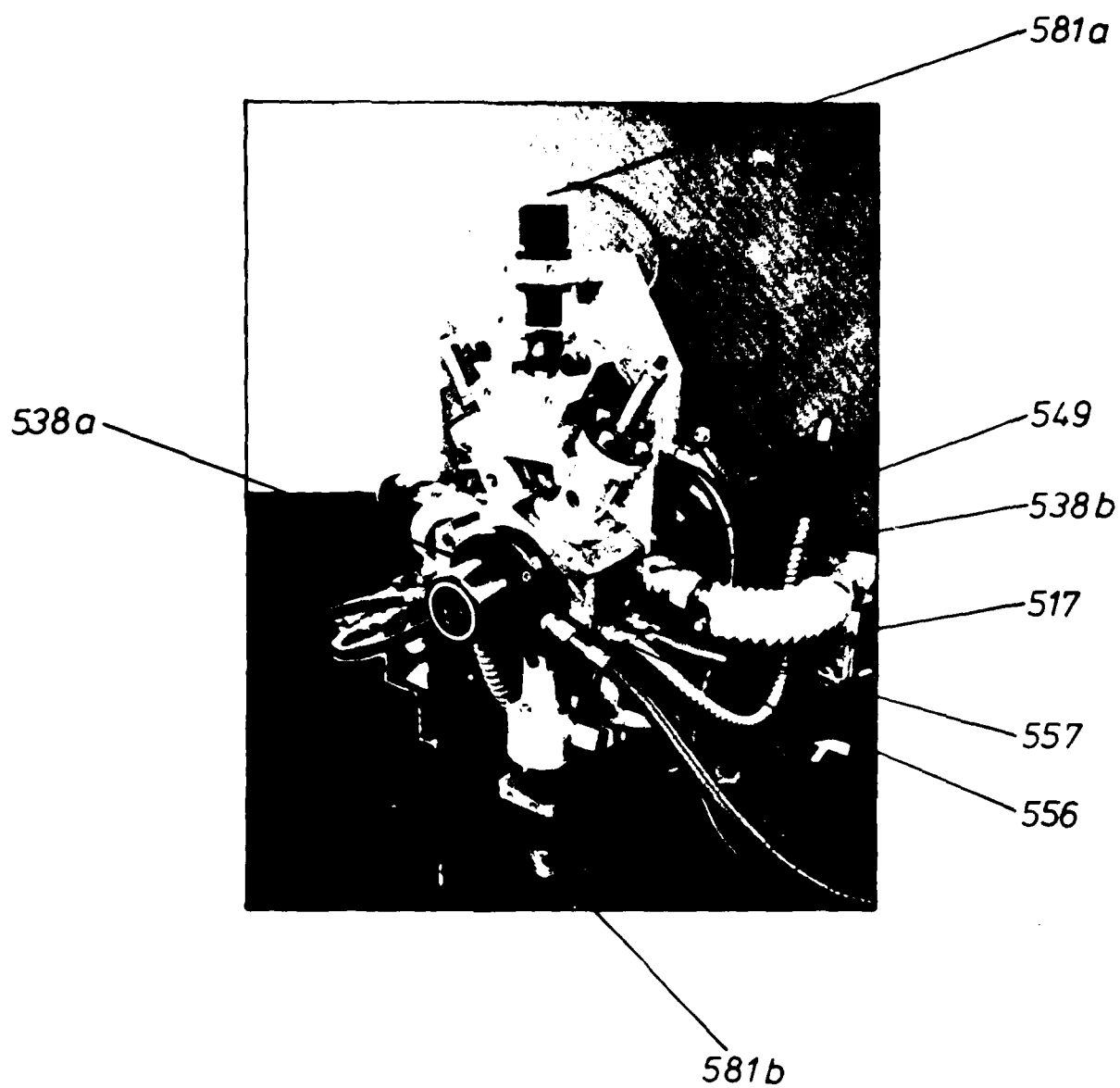
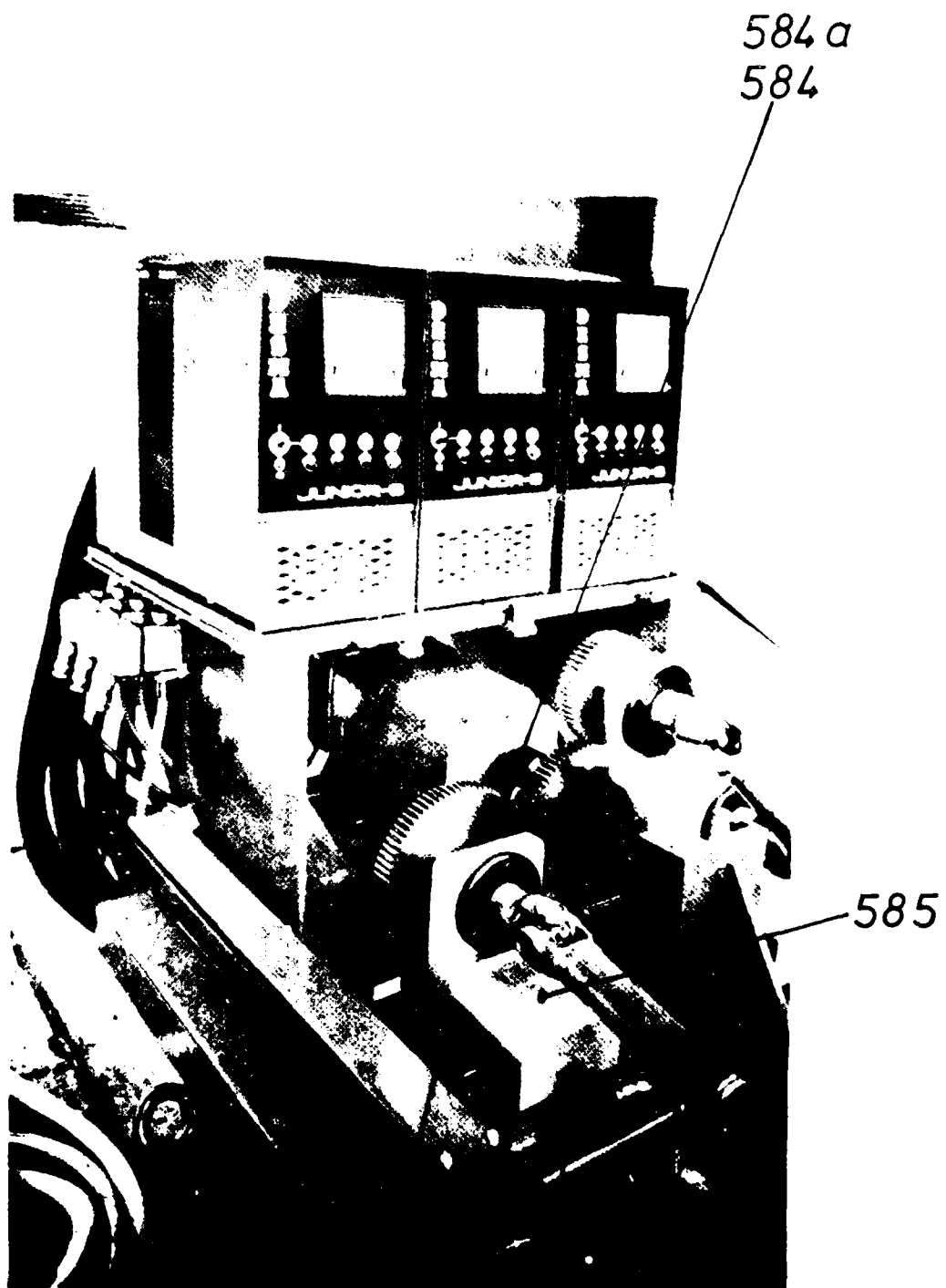


FIGURE NO. 10 MIXING HEAD





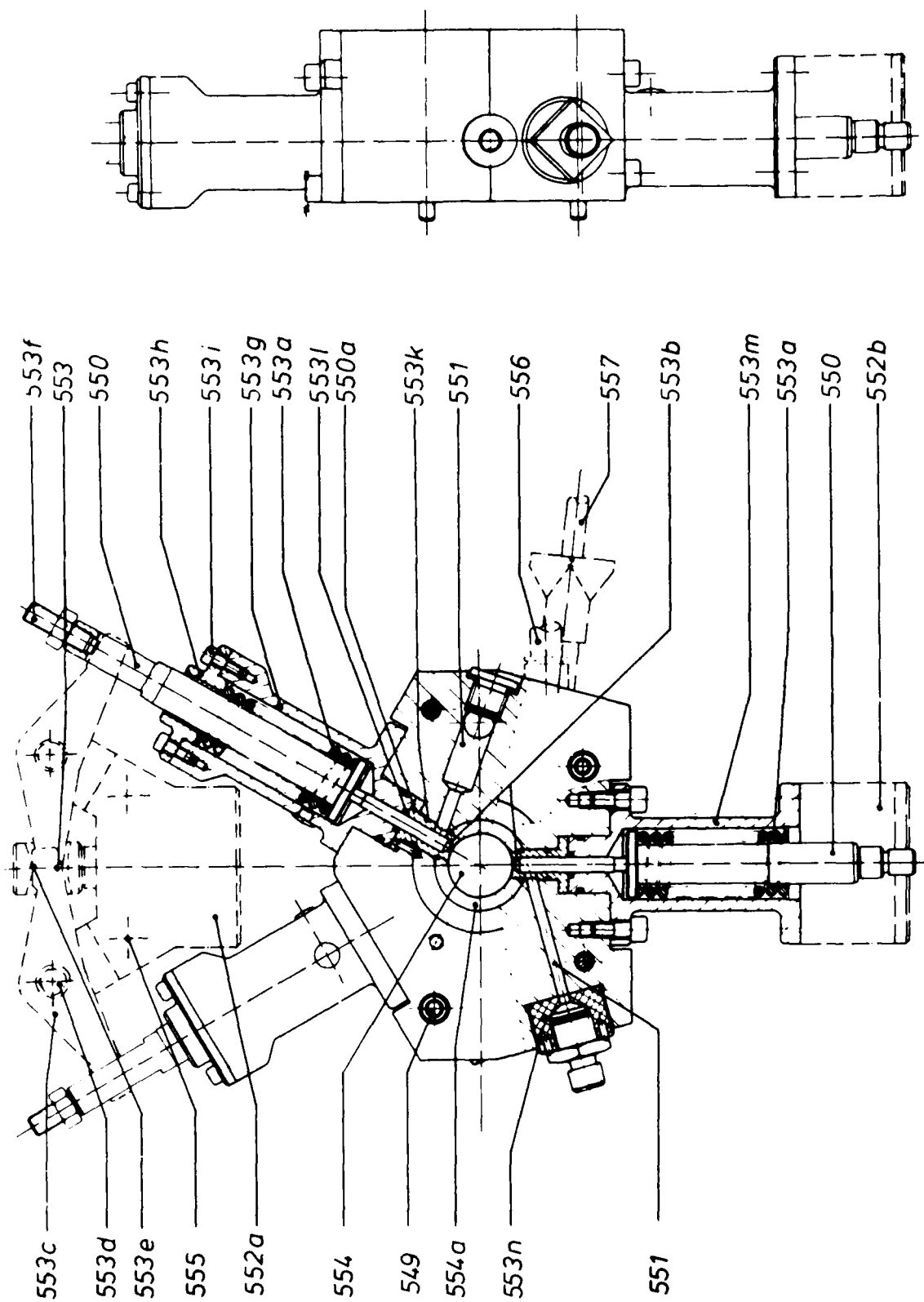


FIGURE NO. 17 METERING VALVES

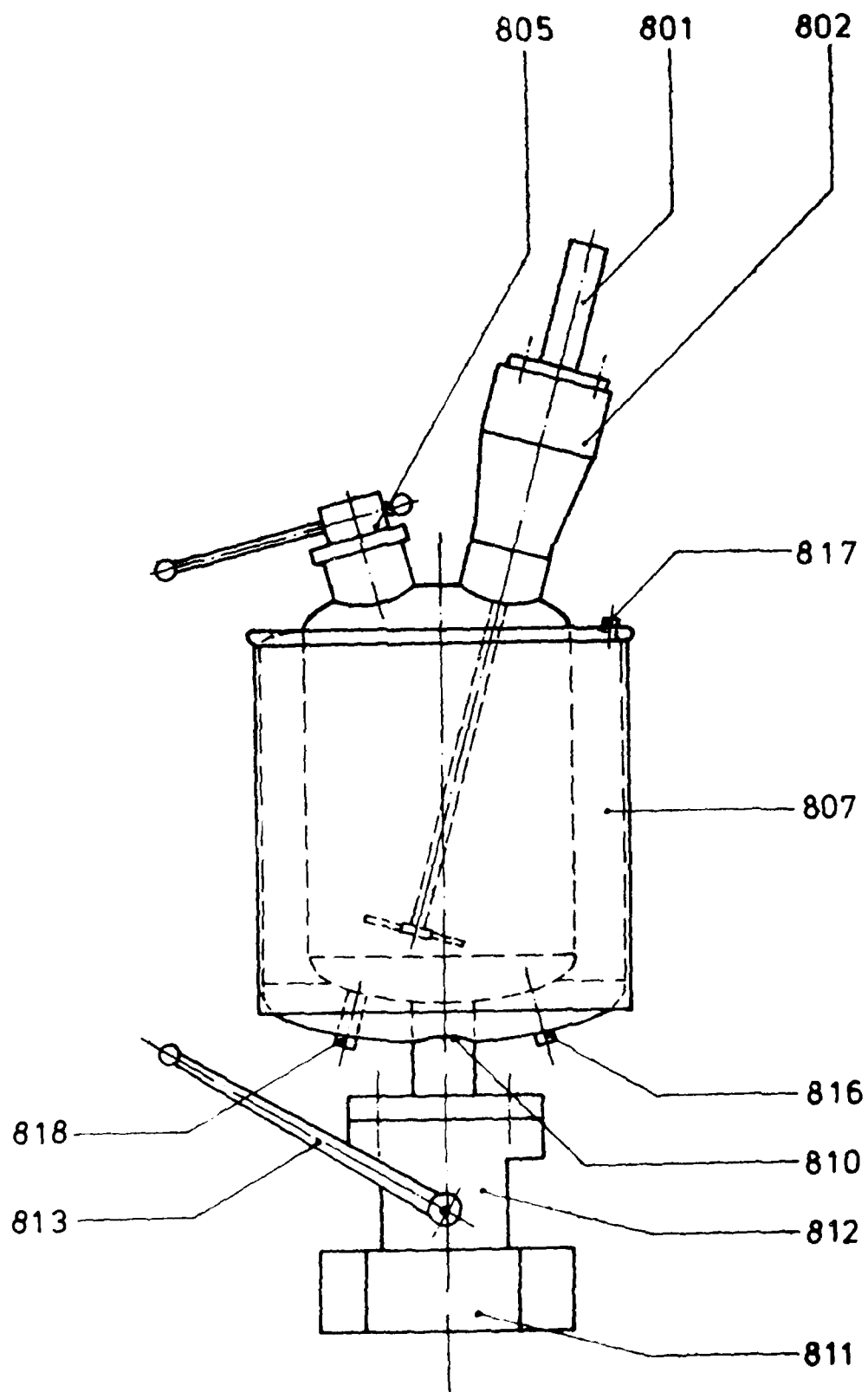
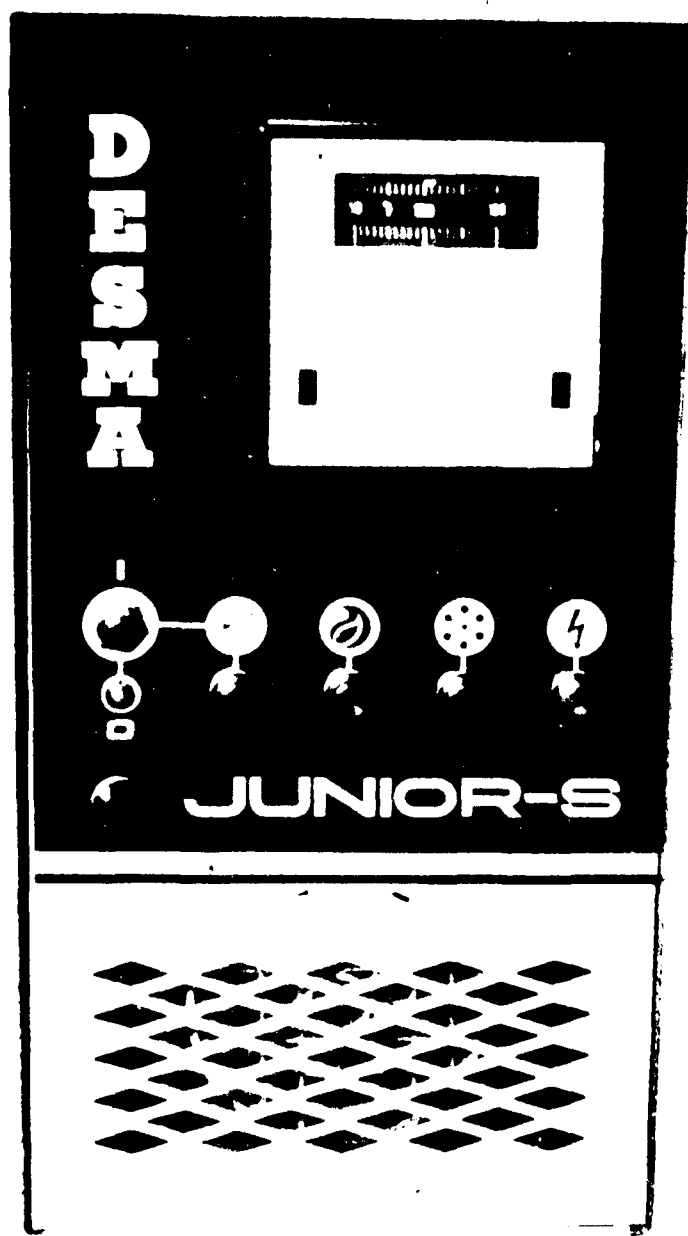


FIGURE NO. 18 COMPOUND SUPPLY TANK



110161 110161 EXCHANGER

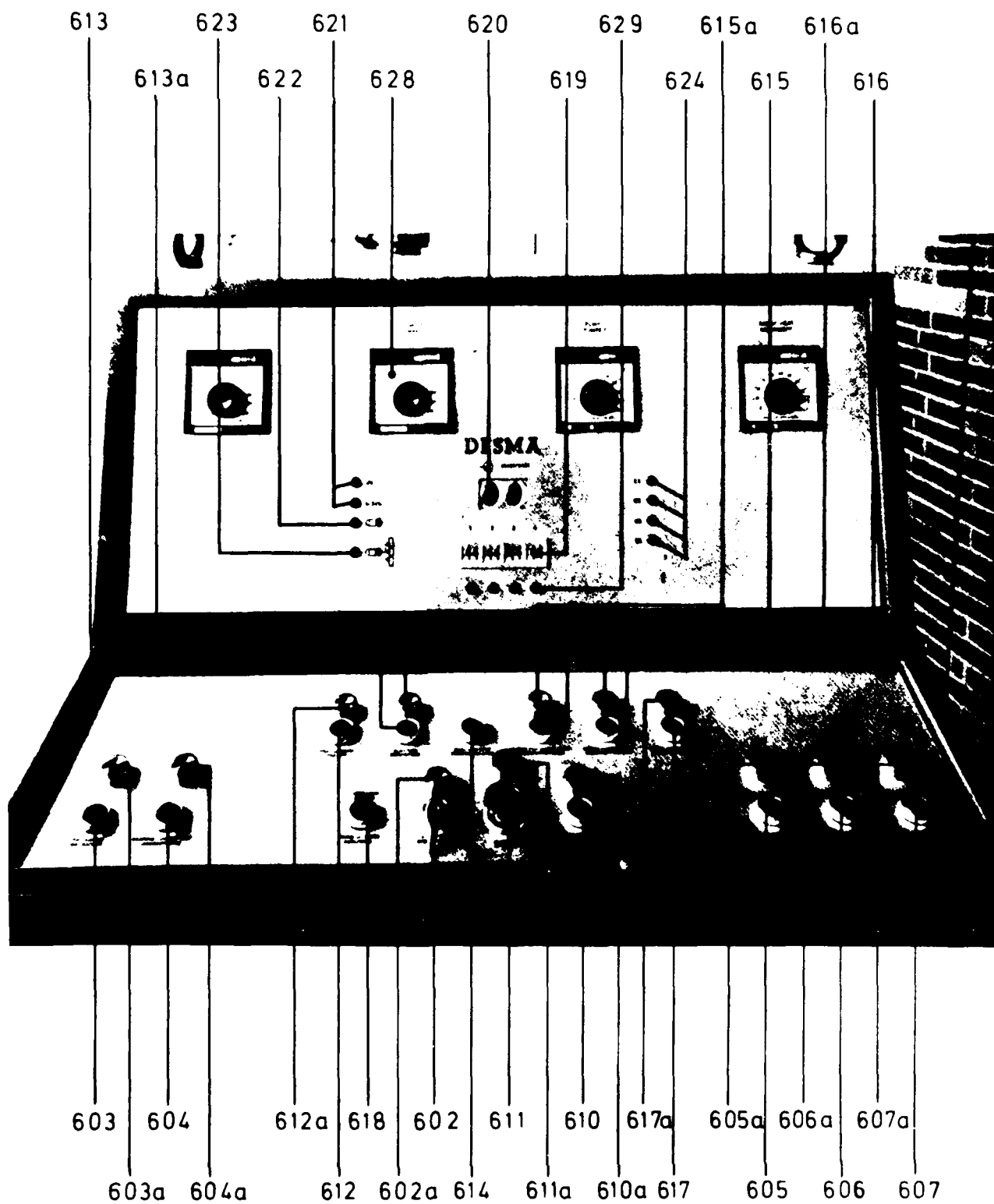


FIGURE NO. 10 ELECTRICAL CONTROL CABINET

A remote control panel (Figure 21) is also mounted to the base platform. The entire foam mixing machine is supported by a rolling carriage (Figure 22), so that it can be moved from mold station to mold station.

The molding operation takes place in a unit mold station that contains one boot mold. The mold is composed of a last (Figure 23), two upper ring halves, and an outsole plate (Figure 24). These are mounted individually and fastened to the movable arms and platens of the mold station (Figures 25, 26, 27). The platens and last are electrically heated. When the station is activated, the upper ring sections come together around the last to form the upper section of the boot cavity and are held clamped together by air-hydraulic pressure pistons. After injection of the foam, the outsole plate is raised to complete the shape of the mold cavity and close off the injection port.

Boot molding takes place in two steps. First, the upper is molded. It is stripped, trimmed, and a release agent is applied in a predetermined pattern, and a fabric tube sock is slipped over the entire upper. The upper is then relasted and the outsole molded to it in a second molding operation so that a complete boot is formed (Figure 28). It is now

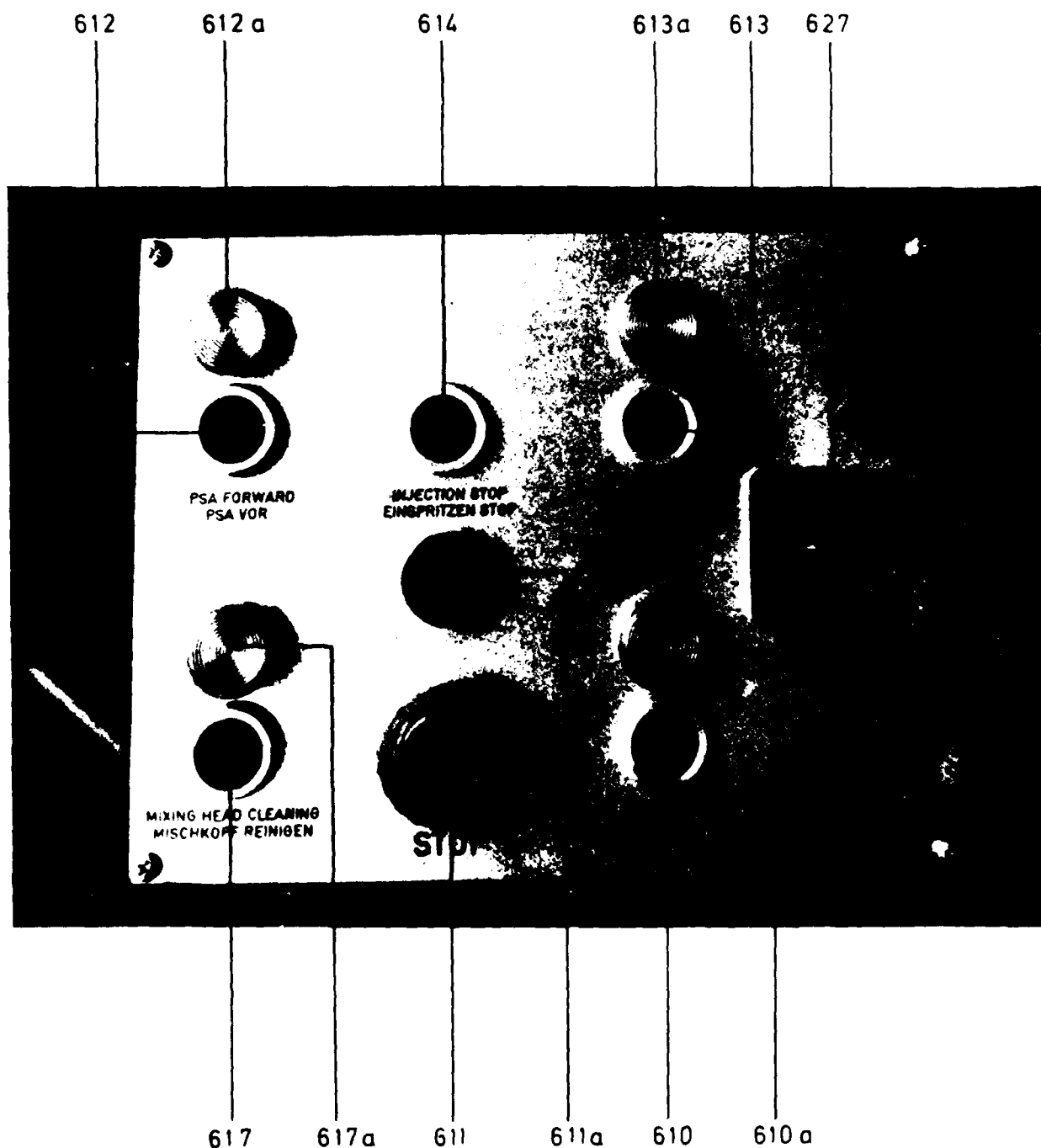
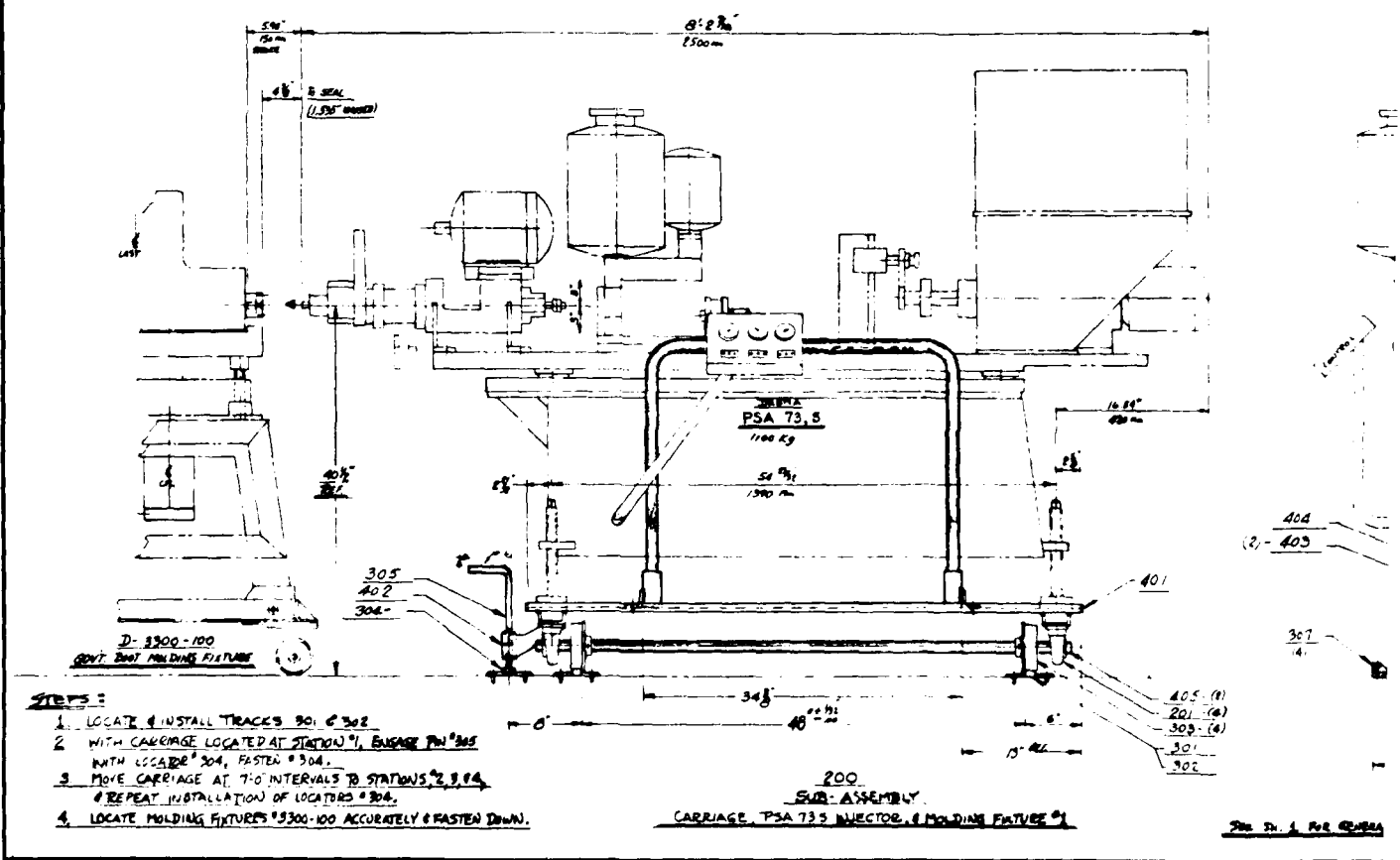
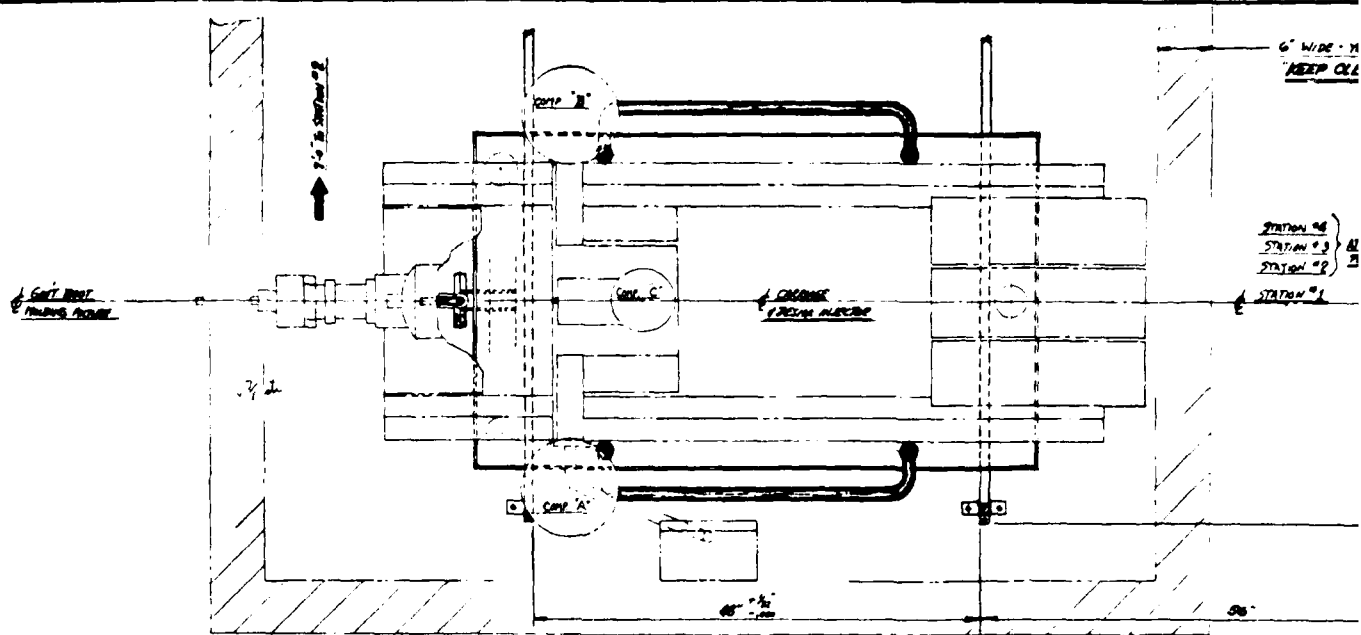
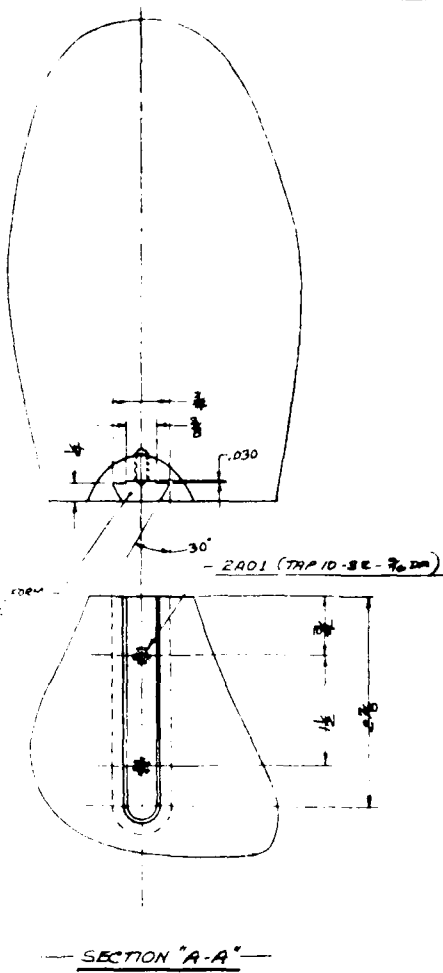
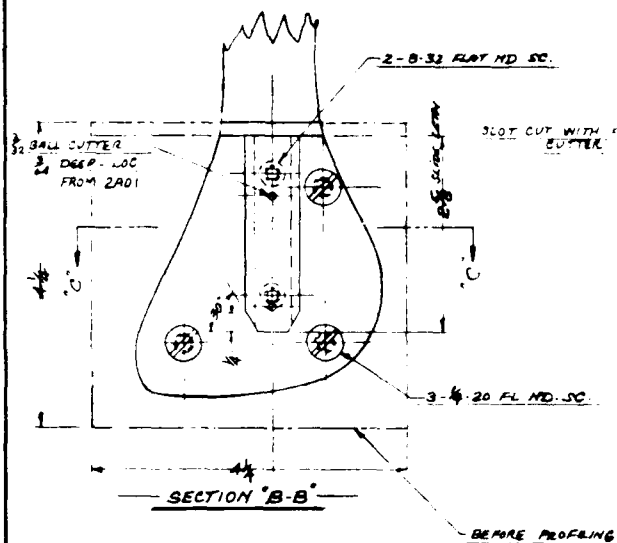
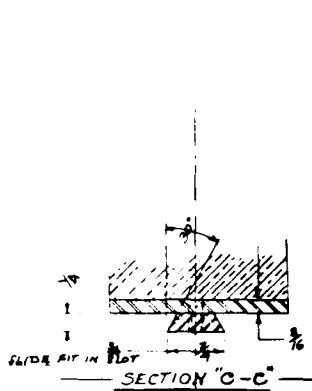


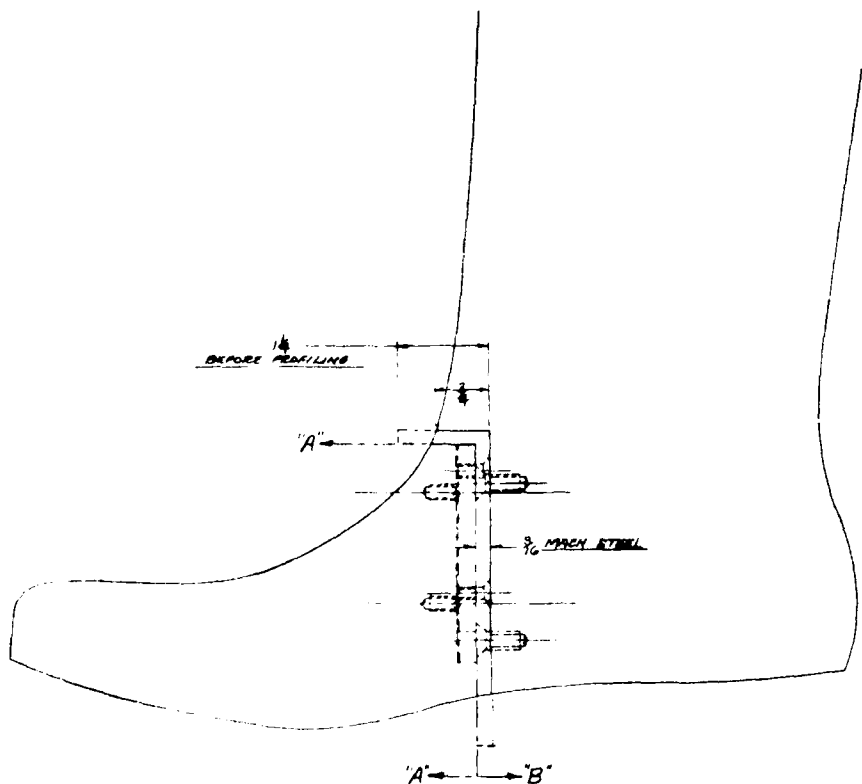
FIGURE NO. 21 REMOTE CONTROL CABINET







- 2A00 —
- SPLIT THE PROCEDURE FOR LAST 11 1/4 MOULD
- 1) SHIP ALUM CAST & REMOVE 1/4" FROM
  - 2) WILL DOVE THE SLOT IN THE HOLE & NOTED BALL PLUNGER
  - 3) PICKLE 3/16" INSERT TO LEG PIECE
  - 4) MOUNT DUE TO THE TO SLOT SLOT
  - 5) FASTEN 3/16" INSERT TO LEG PIECE & 1/4" DIA
  - 6) MACHINE BALL DETENT



2-3/4\"/>

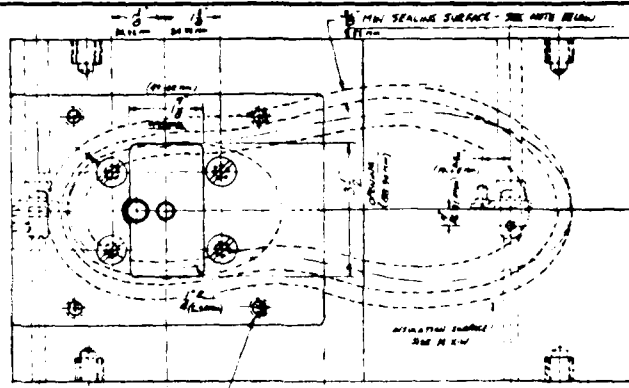
2A00 -  
 THE PROCEDURE FOR LAST WITH MOLD  
 ALUM. LAST & REMOVE 3/8\"/>

FIGURE 2A

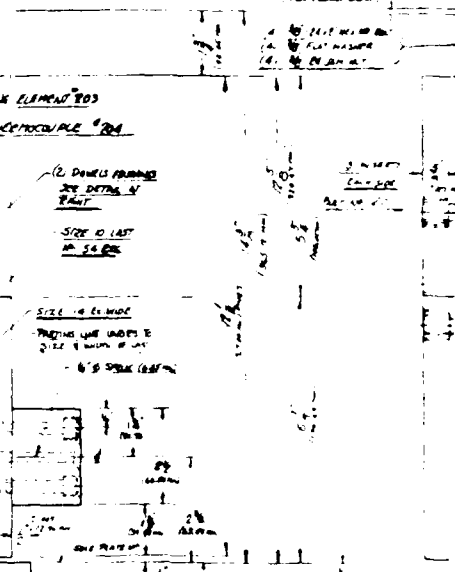
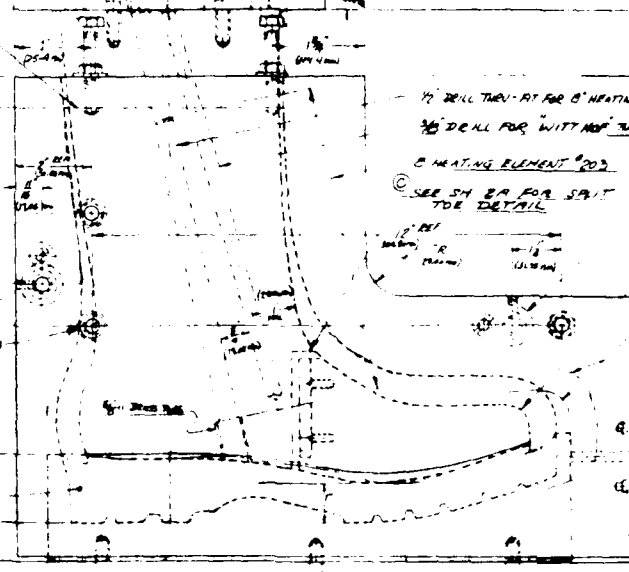
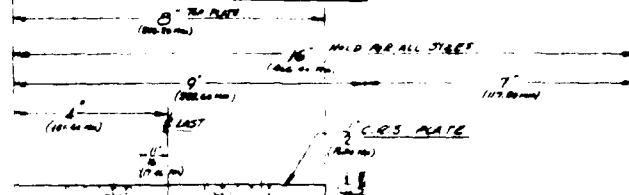
UNIROVAL, Inc.			
ENGINEERING DEPARTMENT			
MANUFACTURING DEPARTMENT			
SALES DEPARTMENT			
DATE: 9/10/54			
BY: [Signature]			
CHECKED BY: [Signature]			
APPROVED BY: [Signature]			
SCALE: 1/2" = 1 FT.			
SHEET NO. 2A			
DWG. NO. D-3300			

(6) DRILL TAP & CHUCK FOR 1/2" X 1/4" G.  
FLAT RD. CAP. 200'S AT ASSEMBLY

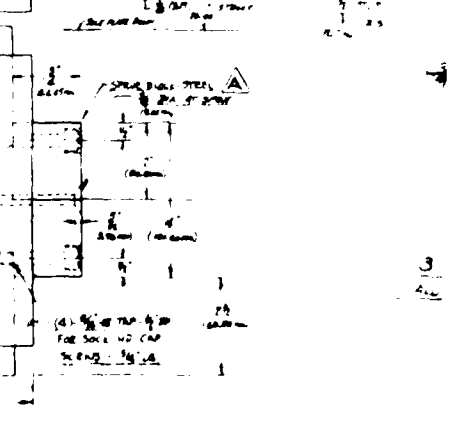
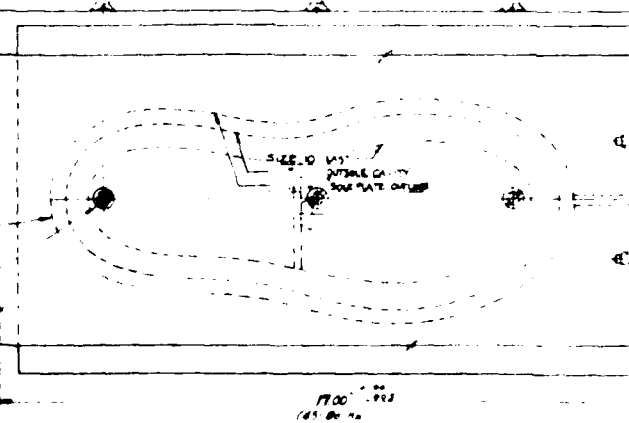
SPEAK BACK NOT SHOWN  
IN THIS VIEW



(4) 1/2" TAP LOCATE FROM  
AT ASSEMBLY



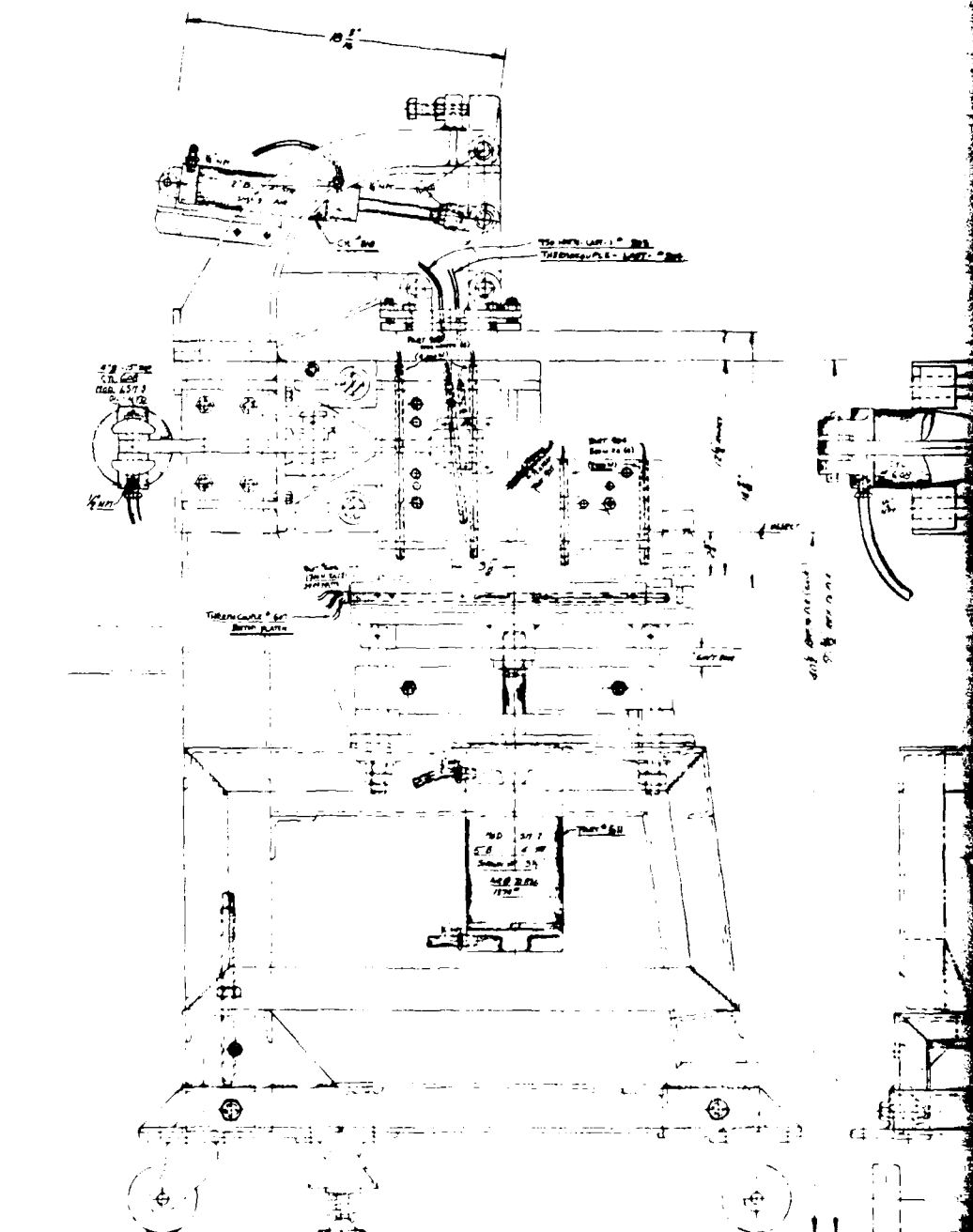
1) LOCATE SELF PLATE ON MILES PLATE  
2) MILE PLATE CLOSED & BE PERIPHERY  
WITH RING SECS. IN POSITION  
3) DRILL TAP & CHUCK FOR 1/2" X 1/4" G.  
FLAT RD. CAP. 200'S AT ASSEMBLY  
CAUTION: DO NOT PENETRATE  
ENGRAVED SECTION







				UNIROVAL		<b>UNIROYAL, Inc.</b> CHRYSLER BLDG. DEPT. 1000 1000 NEW YORK PLAZA NEW YORK, N.Y. 10019	
						POLYURETHANE FOLR MOLDING FILTER SHIP DATE TIME "B" RE USE "B" & CLEAN BOOT ASSEMBLY FOR "B" BOOT SHOWA	
DATE	REV.	REVISION	BY	APP.	DATE	REASON	DATE
					DATE	REASON	DATE
					SCALE 3" = 1 FT	SHEET NO. 1	
					DWG NO.	D-3300	



ELECTRICAL REQUIREMENTS 110/120 V - 60 CY.  
HEATERS 220 V - 60 CY. - 2000 WATTS  
AIR REQUIREMENTS - 70/80 P.S.I.

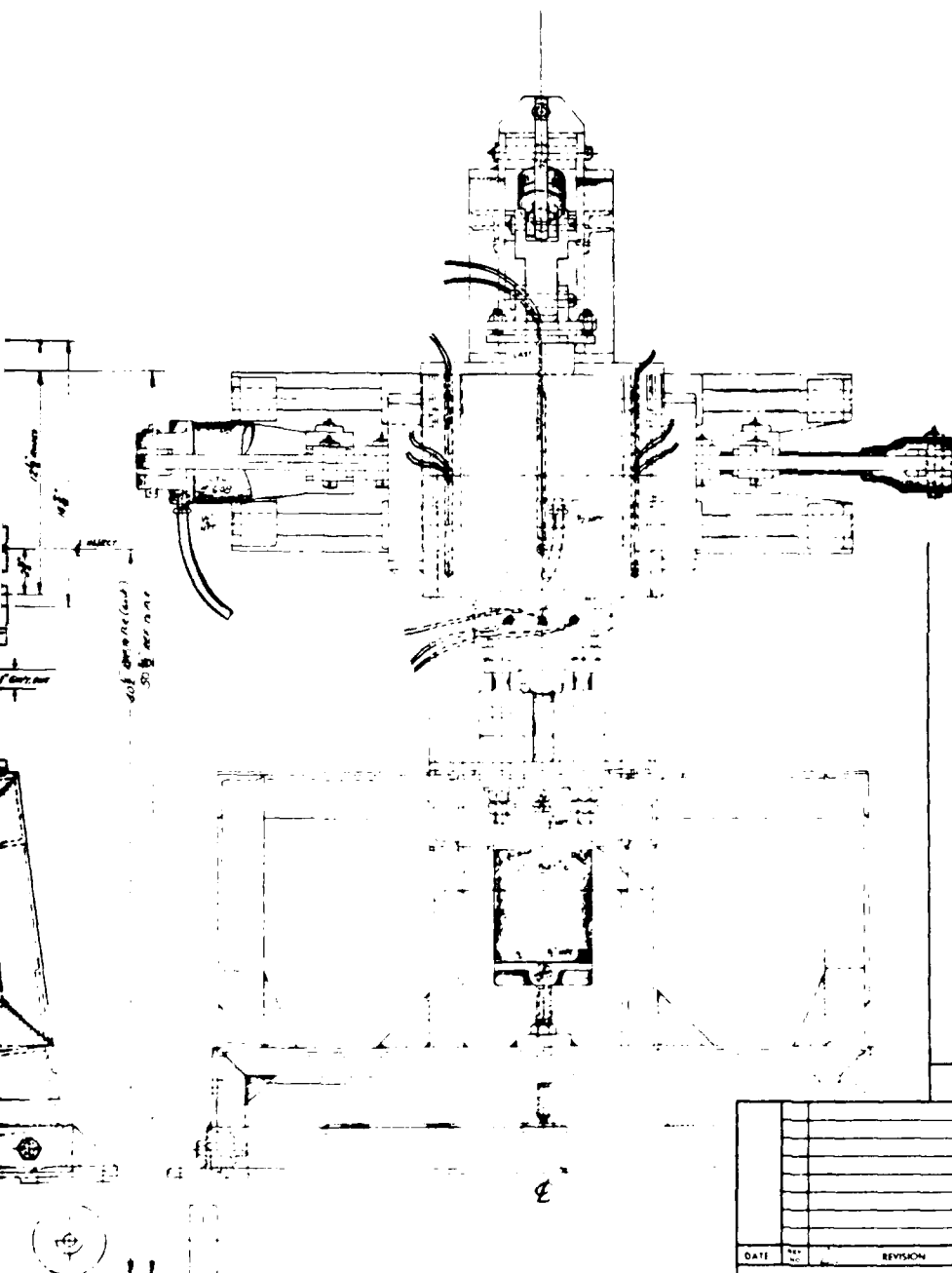

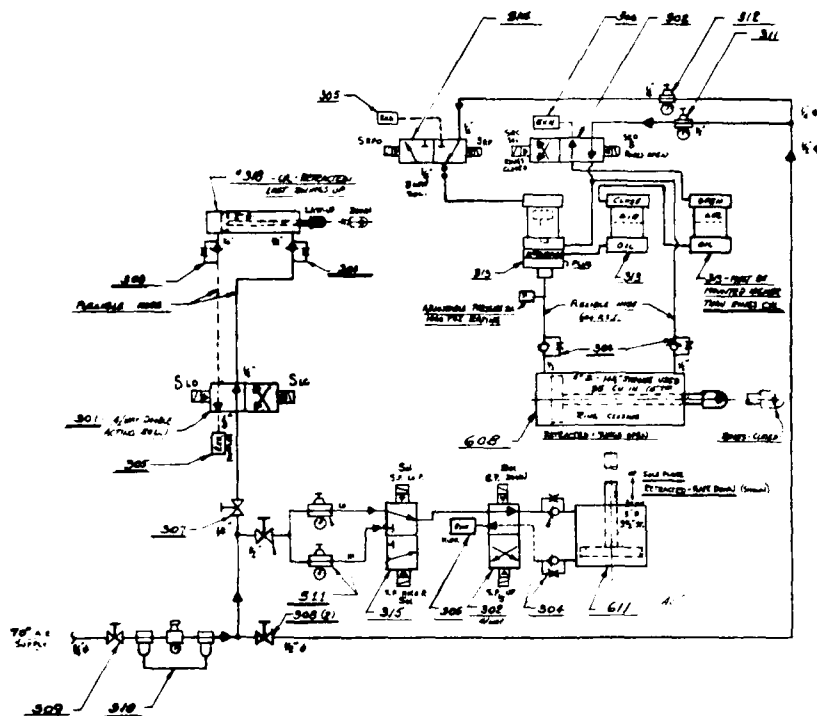


FIGURE 26

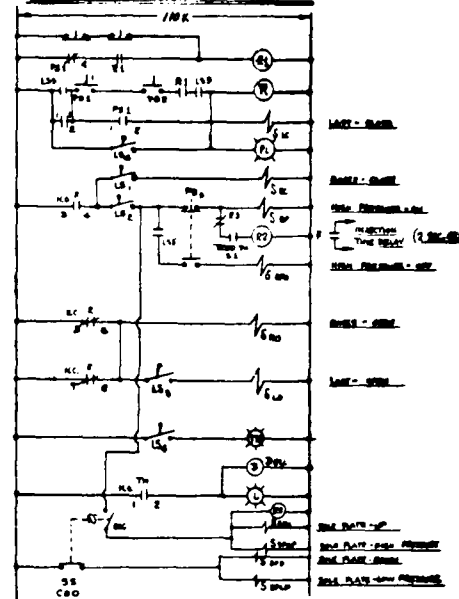
						<b>UNIROYAL, Inc.</b> ENGINEERING DEPARTMENT HAUSTUCKE POSTVILLE PLANT HAUSTUCKE, IOWA, 50557	
				POLYURETHANE ROLL MOLDING ROLLER COMPLETE - "TYPE B" CONTROL & SERVICE ASSY FOR GRILL MOUNT BOOT			
DATE	REV.	REVISION	BY	APP.	DESIGNED BY T.M.	DATE	TRACED BY T.M.
					CHECKED BY T.M.	DATE	APPROVED BY T.M.
					SCALE 3" = 1 FT.		SHEET NO. 1-B
					DWG NO.		D-3300



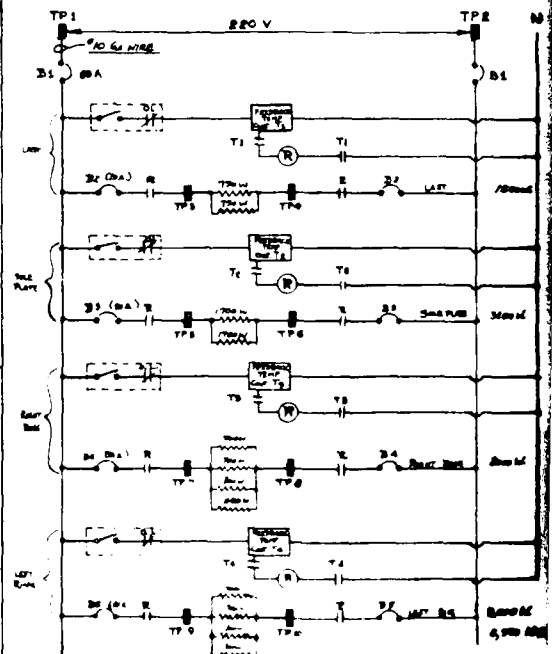
PIPING DIAGRAM  
SEMI-AUTOMATIC OPERATION

D-3146

# CIVILIAN BOOT SYSTEM SEMI-AUTOMATIC SEQUENCE CIRCUIT

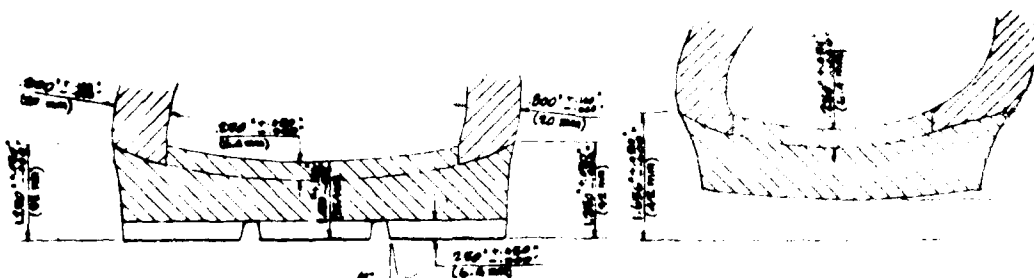


D-3147

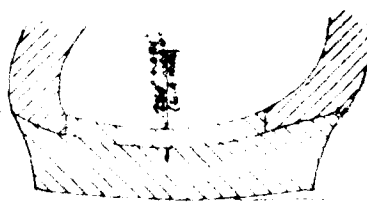


ELECTRICAL WIRING DIAGRAM  
TEMPERATURE CONTROLS

[illegible]



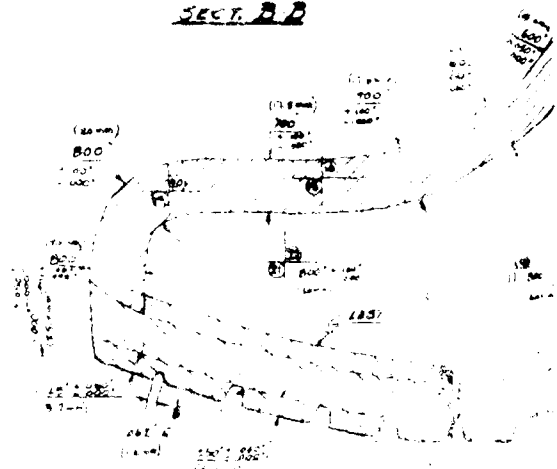
SECT. C-C



SECT. A-A

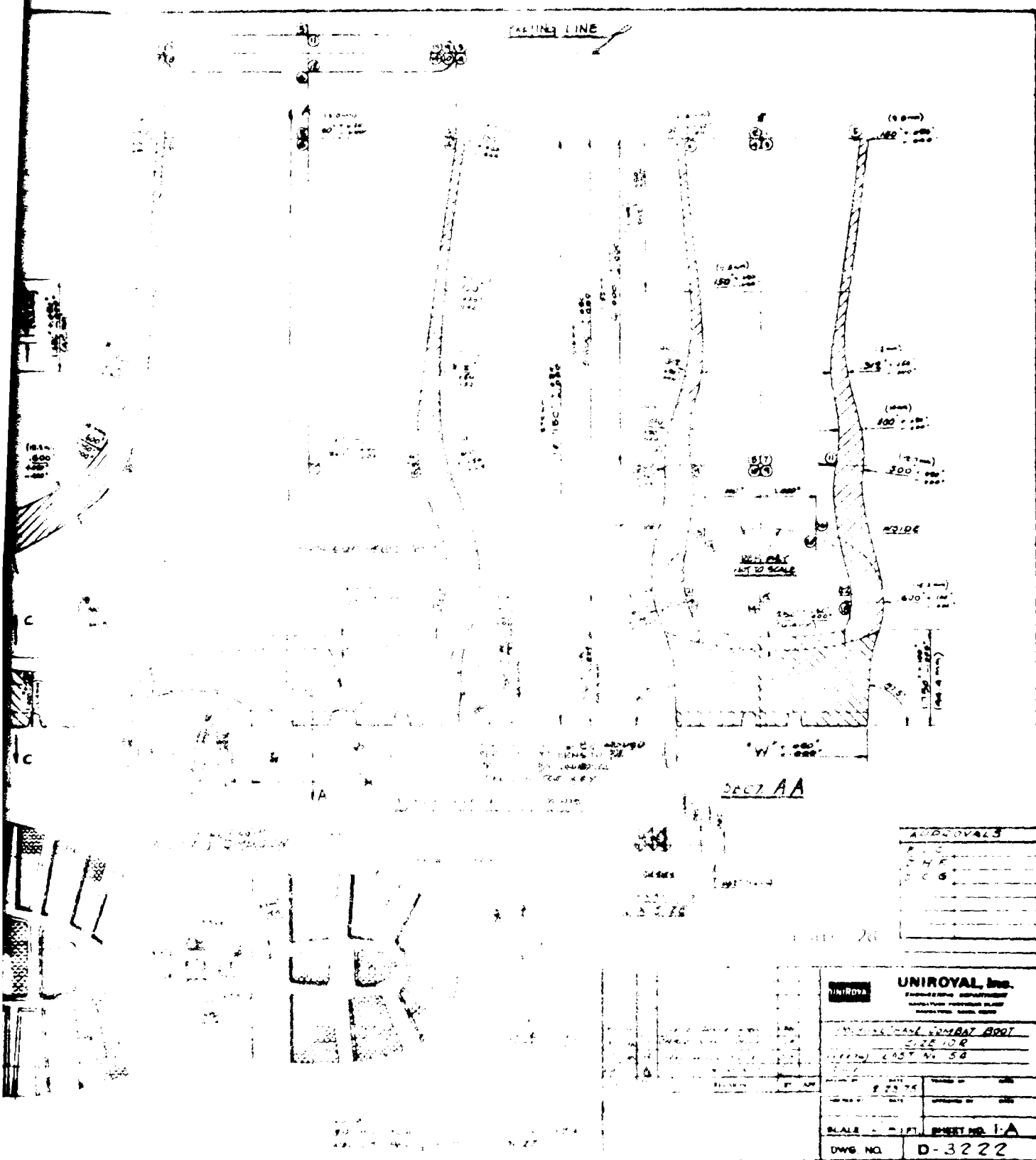
DIMENSION			
SIZE	X"	Y"	W"
4	3.450	2.400	2.957
5	3.250	2.500	3.677
6	3.350	2.000	3.117
7	3.450	2.700	3.187
8	3.650	2.800	3.277
9	3.650	2.900	3.357
10	3.750	3.000	3.437
11	3.850	3.100	3.517
12	3.950	3.200	3.637
13	4.050	3.300	3.677
14	4.150	3.400	3.757

X-Y-W TOLERANCE +.000 - .000



LOG DESIGN SHOWN FOR SIZES 8, 9, 10, 11 -  
DESIGN FOR SIZES 12, 13, 14 AND 15 ETC.  
WILL BE PROVIDED. NOTE A.F.S. TIME OF RAIL  
SEE SHEET 1A





finish trimmed, buffed, and inspected and is ready for application of the outer skin.

B. Detailed Equipment Requirements

1. Supply Tanks - Foam Injection Unit

There are three supply tanks (Figure 18) with steel double walls and necessary fittings for recirculating, heating and cooling media, variable speed agitators, top fill ports, bottom drain cocks and stainless steel screen filters. The tanks are equipped for gas pressure (nitrogen or dry air) up to five atmospheres with the necessary safety valves, regulators, and line valves. All tank seals are of Viton or Teflon.

The tanks have the following capacities.

"A" Component - 12 Liters  
"B" Component - 12 Liters  
"C" Component - 2 Liters

2. Heat Exchangers

Three heat exchangers (Figure 19) are mounted on the rear of the foam mixing carriage. The heat exchangers are filled with an oil that is recirculated to the various parts of the equipment that require temperature control. These include the jacketed supply tanks, traced compound supply lines, bearing housing and mixing head.

The heat exchanger (Figure 19) is composed of a drive motor attached to a circulating pump that is supplied with the heat exchange fluid (Mobil Therm 603, Mobil Oil Co.) from a supply reservoir. Within the supply reservoir is an electrical heating element and a cooling coil supplied with temperature controlled water/glycol solution from a chiller unit. After the temperature selector has been set the sensing probe sends signals to either the solenoid that opens the water supply to the cooling coil, or to an electrical relay that switches on the current to the heating element. In this way, depending on the in-process condition of the specific piece of equipment controlled by the heat exchanger, the temperature can be controlled.

As you face the rear of the foam machine (Figure 29), the heat exchanger to the right controls the "B" component (hardener); the middle heat exchanger controls the "C" component or blowing agent; and the left heat exchanger controls the "A" component (prepolymer). The chiller unit supplies temperature controlled water/glycol to the three heat exchangers plus the bearing housing and mix head.



The "A" and "B" component heat exchangers are capable of controlling in a range of 21°C to 121°C, and the "C" component can control in a range of 0°C to 20°C. The chiller unit supplies cooling media in a range of 0°C to 38°C.

### 3. Electrical Control Console

The electrical switch and control cabinet (Figure 20) comprises all switch, control, and regulating devices, which are required for the operation of the foam injection unit. Manual operation offers the possibility of independently controlling the individual operating processes of the unit by actuation of the corresponding push buttons.

All functions of the injection machine are controlled by the electrical console, and the individual functions are indicated on the front panel where the push button switch and signal lights are located, (Figure 20).

On the upper control panel section are four temperature regulators. There is one regulator for each of the four regulating circuits. From left to right the circuits control "A" component, "B" component, "C" component, and mixing head. Heating is effected by heating cartridges in the part to be controlled. In the center of the upper control panel are the settings for the impulse counters. Four different shot times can be set up to a limit of 99 impulses, and then the desired size shot can be made through the remote

selector (Figure 21), on the injector platform. A digital read-out of the time setting is activated when the shot is made. There are also control lights that come on as the various operational sequences are performed.

On the bottom half of the control panel are located the switches and signal lights for the balance of the functions. At the extreme left is the switch (PSA Heating) to activate the heating elements and controls for the "A" "B", "C" components and the mixing head. Next to this switch is the Bearing Cooling Switch. At the extreme right are the three switches for the heat exchangers (Figure 29), located on the foam unit platform. In the center of the bottom control panel are the main operating switches including the ON/OFF control, Emergency Stop, Injector Forward, Mixing Head Valve, Clean Mixing Head, Mixing Head Motor, Fix of Ratio, Injection Stop, and the key control which allows locking the controls in the off position.

There is an extension of the control console function that is a remote unit on the injector platform (Figure 21). This allows the operator to control some of the functions at the foam machine. These include the Impulse Selector (station) for proper shot size, Injection, Stop, Platform (PSA) forward, Clean Mix Head, and Control ON/OFF (Stop).

#### 4. Metering Pumps and Drive

The drive for the metering pumps is composed of the drive motor, the gear sets, and the pump supports with the attached metering pumps (Figure 15). The motor is a gear brake motor with a drive rotation of about 60 RPM. It is controlled by the valve initiator which is actuated by the movement of the air cylinder. On the driven shaft of the motor (Figure 16) is an adapter which also acts as a support for the main drive gear. The adapter is equipped with a flag disc which normally has ten flags. These flags pass the metering initiator which counts ten impulses per rotation of the drive shaft.

The ratio gears for the three components can be engaged into the main drive gear by sliding on the guide rails until contact is made. Gear changes can be easily made by sliding the gear away from the drive gear, removing the locking nut, and pulling the gear off the keyed support shaft. Another gear can then be put on the shaft, the locking nut replaced, and the gear re-engaged in the drive gear. The ratio gears drive the metering pumps by means of cardan shafts. The gear side of the cardan shaft is connected by means of a key and clamping screw. The other end of the shaft has a quick disconnect and shear pin.

The metering pumps (Figure 15) are high precision gear pumps, which guarantee a constant quantity being pumped. There is a very tight clearance between all the parts making up the internal pump chamber including gears, shafts, pump casing plates, and cover plates. These pumps should never be run dry to prevent damage to the internal parts.

The metering pumps are fastened to pump heating blocks which have a heater cartridge incorporated in them. This allows temperature control of the metering pump and prevents cool down of the residual compound in the pump between shots.

For the throughout capability of the 100-cc mix head of this injector unit, the sizing of the pumps is 30 cc/rev. for the "A" and "B" component and 6 cc/rev. for the "C" component.

#### 5. Mixing Head

This assembly consists of the mixing head, valves, cooling nozzle, screw bearing, mixing screw, and motor drive (Figure 30).

The mixing chamber (Figure 30) used is 30mm in diameter and is equipped with three valves (Figure 17). The "A" and "B" valves are positioned on top of the mixing head and are actuated synchronously. When looking at



the front of the mixing chamber, the "B" component valve is on the left and the "A" component on the right. The "C" component is positioned beneath the mixing head. It is actuated by a separate cylinder.

The "A" and "B" valves are actuated synchronously by one air cylinder. That means they close and open at the same time with the same speed because of the exact mechanical coupling. This reduces any tendency for lead or lag of one of the ingredients. Valve synchronization is done with the tappet lever and a pressure spring for each valve. In the closed position the air cylinder is not actuated and the springs press the valve down in their seats thus stopping the component supply to the mix chamber. The sealing of the "C" valve also is done by spring pressure, but the valve opens by its own one-way acting air cylinder. The cylinder is directly fastened to the spring sleeve.

The cooling nozzle is attached to the mixing head by three bolts. It is composed of a sleeve and a conical bushing. When these parts are assembled, there is a cavity formed that a cooling media can be passed through. In the recess at the front of the nozzle is a sealing ring to minimize foam leakage during injection.

The mixing screw rotates within the mix chamber/ nozzle combination at a speed of 18,000 RPM. The gap between the screw and mix head is 0.1 mm. The screw is conical in its front part, with the same one angle as the bushing. In the rear part the screw is shaped cylindrically. It is machined over the entire length with a left-hand double thread with a special profile. This means the thread has a negative pitch so the compounded material may flow back easily into the following thread passing the flange which gives excellent compound mixing. The mixing screw is fastened onto the shaft of the bearing unit. This shaft in turn is driven by a toothed belt connected to the drive motor that fits the toothed pulley on the shaft extension. There is also a mechanical adjusting device that allows the screw to be set back 0mm to 20 mm from the front end of the mixing chamber.

Trials are made varying the amount of screw set back until the optimum mix condition is established. The screw can also be made to extend forward up to 1.5-2.0 mm beyond the front edge of the mix chamber, which happens during the cleaning cycle to push any residual compound out.

With the mix chamber is supplied a ratio block assembly and cleaning tools (Figure 31). To use the ratio block, the mixing nozzle and mixing screw are removed from the mixing chamber, and the two halves of the ratio block are inserted until the holes line up with the valve holes. In this way the foam injector can be activated, and by using cups the flow of each component stream can be caught and weighed to assure the ratio is correct.

One cleaning tool fits the conical nozzle section, the other cleaning tool fits the mix chamber; by turning them with a slight forward pressure, any cured compound can be removed.

#### 6. Mold Station

The mold station (Figures 25, 26, & 27) is basically a clamping press that will accommodate the four-piece aluminum boot mold (Figures 23 and 24), consisting of a last, outsole plate, and two outer ring halves. The outsole plate is bolted to the bottom heated platen and the last with internal heaters is fastened to a moveable arm that either lowers the last into the mold cavity or raises it forward and out for delasting. The upper rings are bolted to the movable side platens of the mold station. These platens are heated with internal electric heaters. All electric heaters are controlled by feed-back temperature regulators capable of maintaining the molds at the desired temperature. The mold station will accept molds from Size 4 through 14.

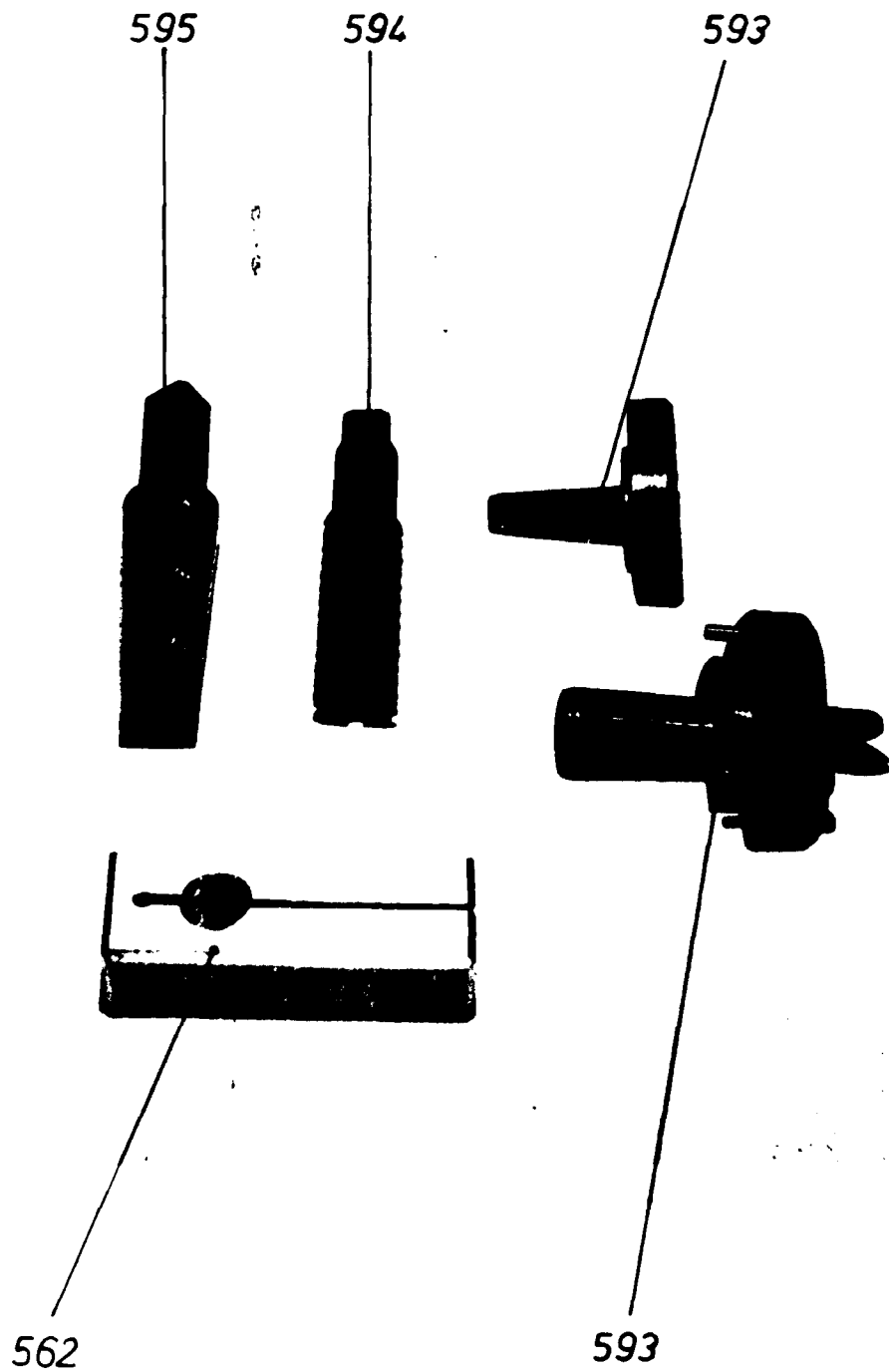


FIGURE NO. 31 RATIO BLOCK ASSEMBLY AND CLEANING

The pressure to close and clamp the mold upper rings is supplied by air-hydraulic cylinders. The last movement and outsole plate raising is accomplished with air cylinders. The closing cycle is activated by pressing the double Start button set up on the control panel. This energizes the switch that controls last position and causes it to be lowered into the mold. With the last in the down position, a second relay is activated that closes the side platens with the attached upper rings. After injection of the foam, the sole plate platen is raised into position by turning on a manual switch on the control panel. The length of time the mold is closed (cure time) is set on a delay timer and at the end of this cycle a warning bell rings and the station is opened by pressing the "Stop" button. The mold opens and last kicks forward for delasting.

C. Operation Sequence for Upper Production

1. Fill the "A", "B", and "C" component supply tanks with the individual upper compounding components from the temperature controlled mixing tanks. This is done by applying nitrogen pressure to the mixing tanks and feeding the compound to the respective supply tanks by a hose connected to the bottom drain. After the supply tanks are filled the agitators should be turned on to keep the compound temperature uniform.
2. Clean mixing head with the appropriate reamer if

required.

3. Install correct metering gear size on drive motor and pump drives.

"A"	-	62 Tooth
"B"	-	81 Tooth
"C"	-	50 Tooth
Drive	-	62 Tooth

This gives a throughput of approximately 86.5 grams/second.

4. Set up control console for operation.

- (a) Turn on Main Power to control console.

- (b) Turn on Main Air supply to foam injection machine.

- (c) At the control console:

- (1) Set temperature controllers for "A", "B", and "C" component pumps and for mixing head. The "A" and "B" controllers should be set at 100 °C and the "C" set at 10 °C.

- (2) Activate PSA Heating button.

- (3) Activate Bearing Cooling button.

- (4) Turn fix of Ratio switch on.

- (5) Activate "A", "B", and "C" Temperature buttons for the pre-set heat exchangers on the foam machine platform and the chiller ("A" & "B" set at 100 °C and "C" set at 10 °C).

- (6) Set impulse selectors to proper value. Depending on the boot size.

<u>SIZE</u>	<u>IMPULSES</u>	(at 86.5 grams/sec. throughput)
8W	43	
9R	41	
9W	44	
10R	44	
11R	47	
14 XW	52	

and set Station 1 for 25 impulses for ratio check and flushing.

(7) Disengage Stop button.

After the compound and equipment are at the control temperatures a ratio check is taken. At this point the control console is left as above and the foam unit is operated from the remote control box on the unit itself.

5. Take Ratio Check - Use Remote Control:

- (a) Insert ratio-blocks.
- (b) Disengage Stop button.
- (c) Activate Control button.
- (d) Turn Station Selector to Number 1 for impulse control.
- (e) Inject three or four pre-shots to eliminate air in lines.
- (f) Hold cups over the three tubes of ratio blocks.
- (g) Activate Injection button.
- (h) Catch pump output and weigh.

Adjust flow if necessary by ratio gear change.

Ratio should be 100 parts of "A" to 51.4 parts of "B" to 19.5 parts of "C". If the ratio varies by more than  $\pm 1$  on Isocayante Index, adjust by changing ratio gears to proper size.

(i) Push down Stop button.

6. Take foam cup check:

(a) Set control console:

- (1) Move Fix of Ratio switch to operation.
- (2) Activate button for Motor for Mix Head.

(b) At foam injection unit:

- (1) Remove ratio blocks, put screw in and fasten on mixing nozzle.
- (2) Disengage Stop button.
- (3) Activate Control button.
- (4) Activate Inject button.
- (5) Catch cup of foam.
- (6) Activate Mixing Head Clean button.
- (7) Check cup sample for cream, rise, and tack free time.

The cream time should be 3-4 seconds, the rise time, 22-24 seconds, and the tack free time, 50-55 seconds.

(Cream Time: time from discharge from mixer to initiation of blowing. Rise Time: time from cream time to full expansion.

Tack Free Time: time from discharge

from mixer until foam surface is not tacky to light touch).

7. Set up boot molding station.

- (a) Bolt in mold sections last, upper rings and outsole plate.
- (b) Insert electrical heating elements into last.
- (c) Set temperature control instruments on control panel for all mold sections to 200<sup>o</sup> F (93<sup>o</sup> C) and set cure timer to 15 minutes.
- (d) Place outsole insert into mold.
- (e) Hood sockliner, (Figure 32), on heated last and tape seams. (Figure 33).
- (f) Activate the two Start switches on the control panel simultaneously. This closes the mold station.

8. Inject upper mold (using remolt control)

- (A) Line up foam injector to mold station.
- (b) Place Station Selector to proper number.
- (C) Activate PSA for ward.
- (d) Activate injection button.
- (e) Retracting of carriage and cleaning of mix head are automatic.
- (f) Raise outsole plate by activating switch in mold station control panel. This closes off injection port.

9. Cure Upper Foam:

- (a) Cure foam 15 minutes at 200<sup>o</sup> F (93<sup>o</sup> ).
- (b) Open station, (Figure 34), by pressing Stop button at end of cure cycle.

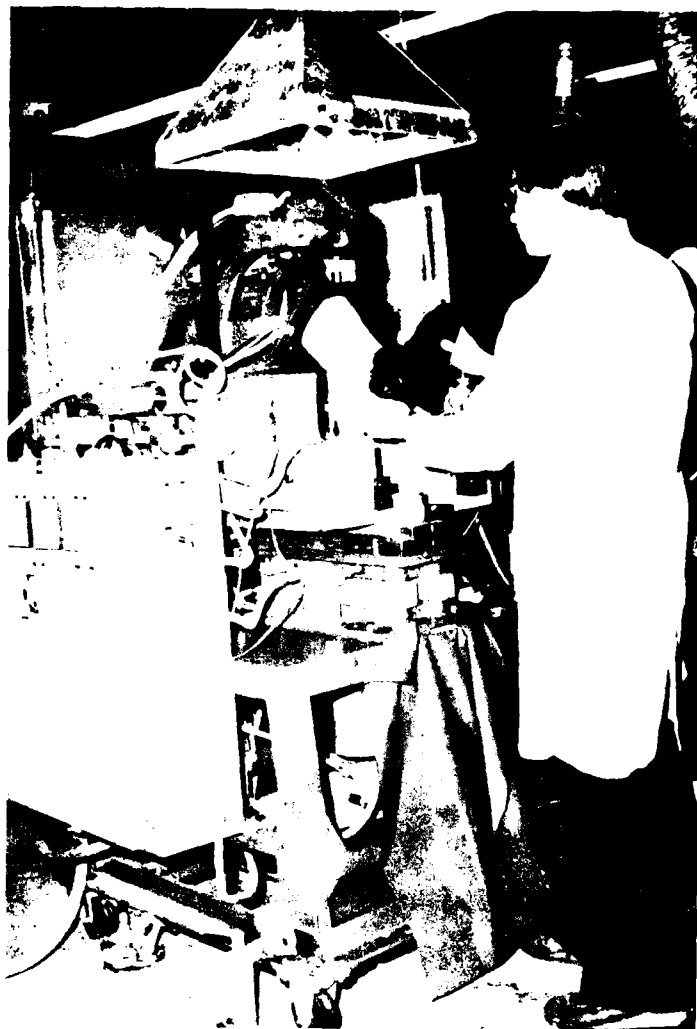


FIGURE NO. 32 HOODING SOCKLINER ON LAST

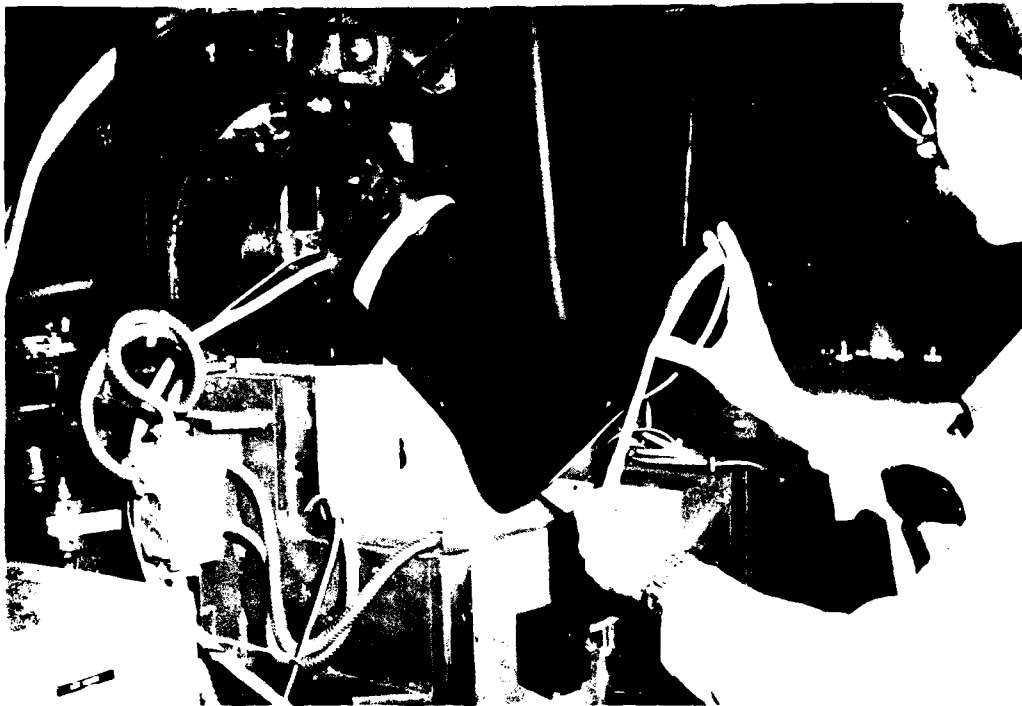


FIGURE No. 33 TAPING SOCKLINER SEAMS

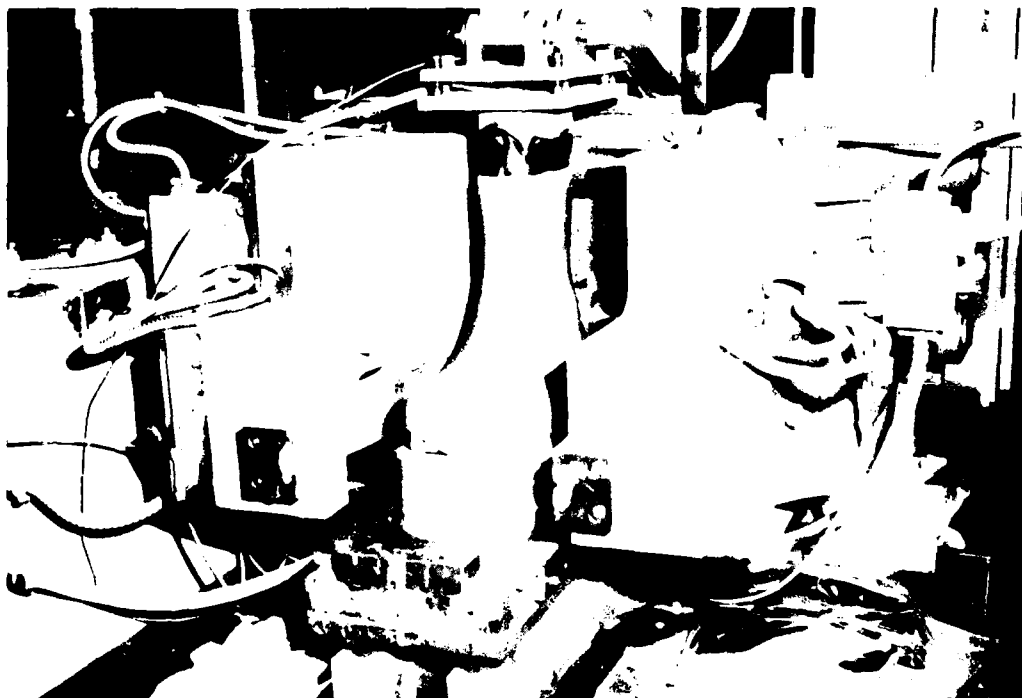


FIGURE No. 34 OPEN-MOLD STATION

(d) Trim and buff.

(e) Inspect and repair if required.

10. Apply release to foam upper.

(a) Attach spray mask to boot.

(b) Spray release agent (Figure 35.)

(c) Air dry 30 minutes at room temperature.

(d) Detach spray mask.

11. Slip fabric tube sock over foam upper, (Figure 36).

(Tube Knit socks, sewed one end, Style 9999,

Burlington Socks Co, Asheboro, N. Carolina).

D. Operation Sequence For Outsole to Upper Application.

1. Fill the "A" and "B" component supply tanks with outsole compound from the temperature controlled mixing tanks. This is done by applying nitrogen pressure to the mix tanks and feeding the compound to the respective supply tank by a hose connected to the bottom drain. After the tanks are filled, the agitators should be turned on to keep the compound temperature uniform.

2. Clean mix head with appropriate reamer if required.

3. Install correct metering gear size on drive motor and pump drives and disconnect "C" drive.

"A" - 62 Tooth

"B" - 66 Tooth

Drive - 50 Tooth



FIGURE NO. 35 SPRAYING RELEASE AGENT



FIGURE NO. 36 APPLICATION OF TUBE SOCK

This gives a throughput of approximately 58.2 grams/sec.

4. Set up control console for operation.

(a) Turn on Main Power to control console.

(b) Turn on Main Air Supply to foam injection machine.

(c) At the control console:

- (1) Set temperature controllers for "A" and "B" component pumps and for mix head. The "A" and "B" controllers should be set at 75 °C.
- (2) Activate PSA Heating button.
- (3) Bearing Cooling button.
- (4) Turn fix of Ratio Switch.
- (5) Active "A" - "B" temperature buttons for the pre-set head exchangers on the foam machine platform and the chiller ("A" and "B" set at 72 °C and the chiller set at (10 °C) ).
- (6) Set impulses selectors to proper value depending on boot size.

<u>SIZE</u>	<u>IMPULSES</u>	(at 58.2 grams/ sec. throughout
8W	68	
9R	70	
9W	73	

<u>SIZE</u>	<u>IMPULSES</u>
10R	84
11R	83
14XW	87

And set Station 1 for 25 impulses for ratio check and flushing.

(7) Disengage Stop Button.

(After the compound and equipment are at the control temperature, a ratio check is taken. At this point the control console is left as shown above and the foam unit is operated from the remote control box on the unit itself.

5. Take Ratio Check - Use Remote Control

- (a) Insert ratio blocks.
- (b) Disengage Stop Button.
- (c) Activate Control Button.
- (d) Turn Station Selector to Number 1 for impulse.
- (e) Inject three or four pre-shots to eliminate air in the lines.
- (f) Hold cups over both tubes of ratio blocks.
- (g) Activate Injection button.
- (h) Catch pump output and weigh.
- (i) Adjust flow if necessary by ratio gear change.  
Ratio should be 100 parts of "A" to 86.5 parts of "B". If the ratio varies by more than  $\pm 1$  on Isocyanate Index, adjust by changing ratio gears to proper size.
- (j) Push down stop button.

6. Take Foam Cup Check:

(a) Set Control Console:

- (1) Move Fix of Ratio switch to Operation.
- (2) Activate Button for Motor for Mix Head.

(b) At Foam Injection Unit:

- (1) Remove ratio blocks, put screw in and fasten on mixing nozzle.
- (2) Disengage Stop button.
- (3) Activate Control Button.
- (4) Activate Inject Button.
- (5) Catch cup of foam.
- (6) Activate Mix Head Clean Button.
- (7) Check cup sample for cream, rise and tack free time: The cream time should be 3-4 seconds, the rise time 32 - 40 seconds and the tack free time 34 - 36 seconds.

7. Set up Boot Molding Station:

- (a) Set temperature control instruments on control panel for all mold sections to 200<sup>o</sup> F (93<sup>o</sup> C) and set cure timer to 15 minutes.
- (b) Remove outsole insert from mold.
- (c) Hood fabric covered upper on heated last (Figure 37).
- (d) Activate the two Start switches on top of the control panel simultaneously. This closes the mold station.

8. Inject Outsole Mold (Using Remote Control):

- (a) Line up foam injector to mold station.
- (b) Place Station Selector to proper number.



FIGURE NO. 37 UPPER WITH TUBE SOCK RELATED

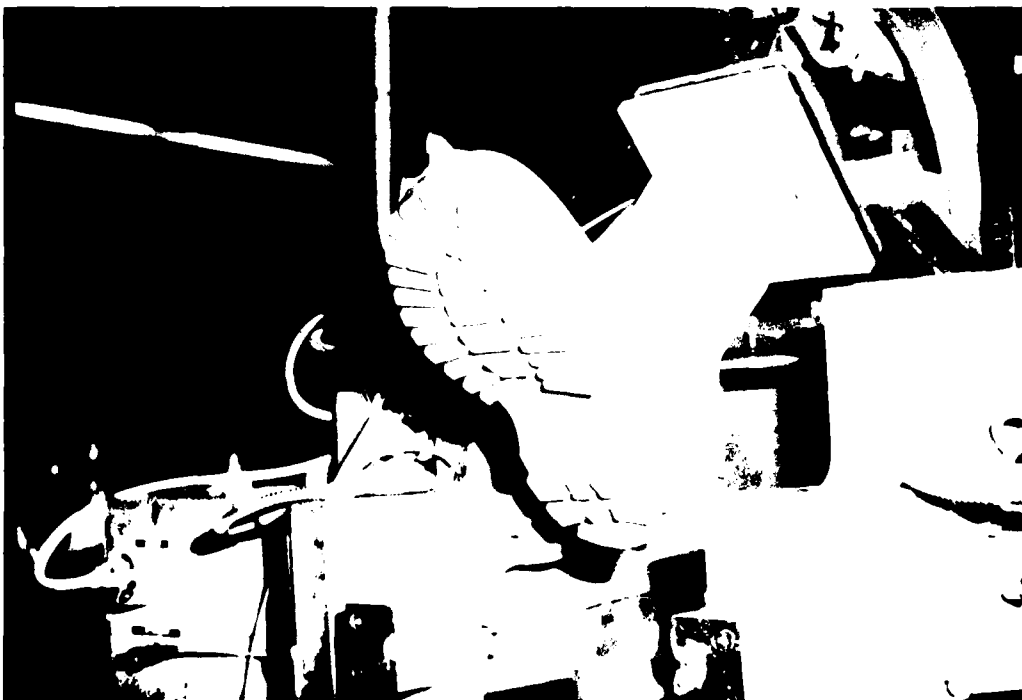


FIGURE NO. 38 OPEN MOLD STATION WITH COMPLETE BOOT

- (c) Activate PSA Forward.
- (d) Activate Injection button.
- (e) Retracting of carriage and cleaning of mix head are automatic.
- (f) Raise outsole plate by activating switch in mold station control panel. This closes off injection port.

9. Cure Outsole Foam:

- (a) Cure foam 15 minutes at 200<sup>o</sup> F (93<sup>o</sup> C).
- (b) Open station by pressing Stop Button at end of cure cycle, (Figure 38).
- (c) Strip boot.

10. Prepare Boot for Spraying:

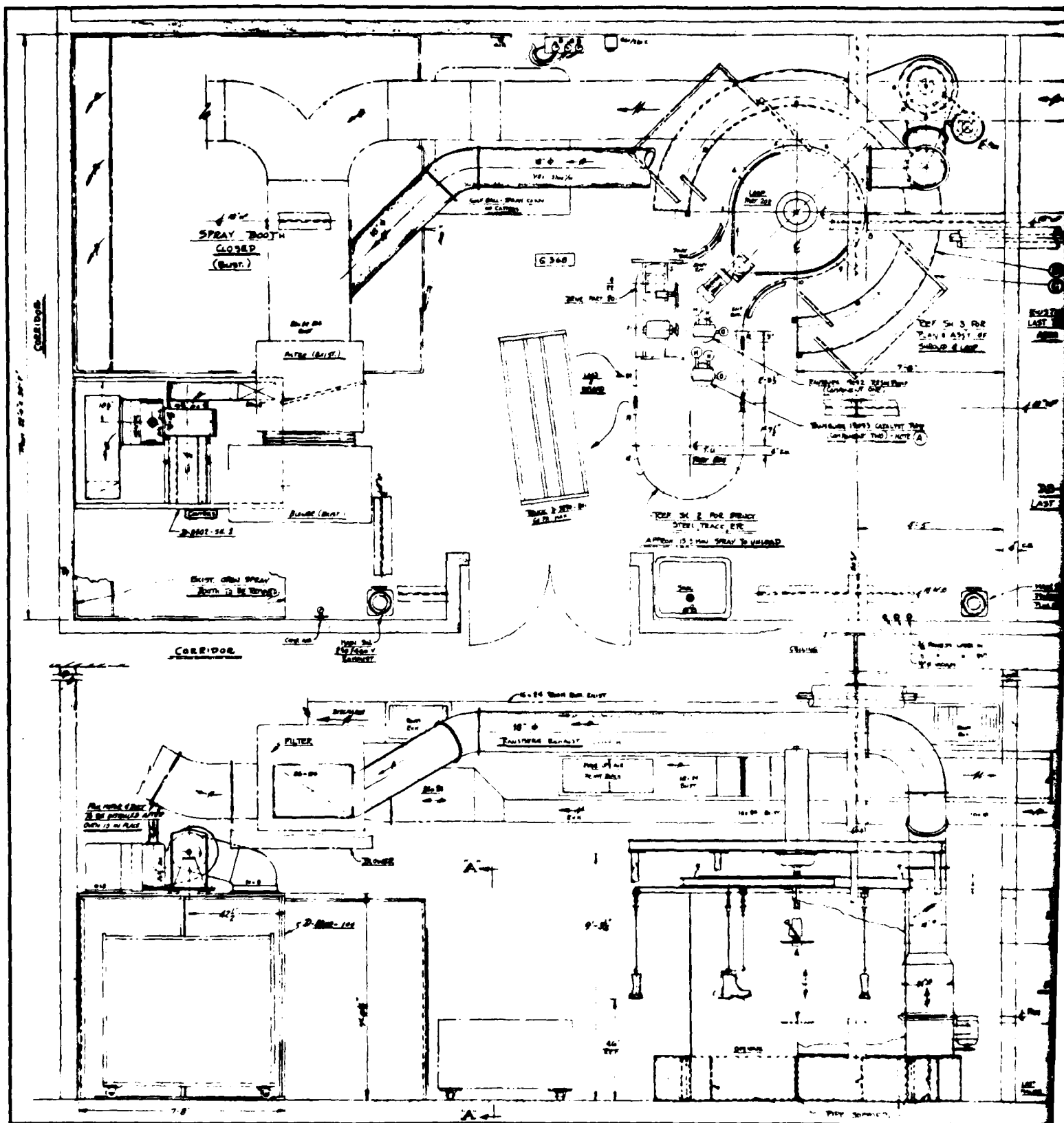
- (a) Trim and buff flash.
- (b) Inspect and repair if necessary.
- (c) Place mask on bottom of boot. (This mask is a flat piece of polyurethane 0.035" (0.035" (.014) thick cut 1/8" (0.32 cm) over size of the molded outsole).

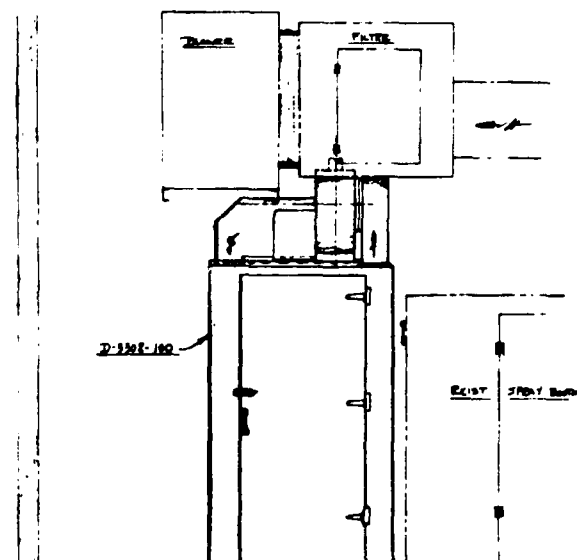
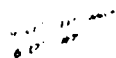
The boot is now ready for application of the outer skin coating by the electrostatic spraying process.

## VI. ELECTROSTATIC SPRAYING

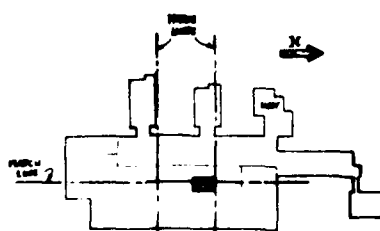
### A. General Equipment Requirements

It has been found that utilization of electrostatic spray coating equipment (Figures 39, 40, 41, 42, and 43), is the best method of coating the insulated boot. The basic principle is to pump two reactive components to a spinning disc, mixing the components just prior to depositing them in a well located in the center of the disc. The disc can be programmed to raise and lower (Figure 44) in order to deposit the coating where desired from top to bottom. The spinning disc breaks up the mixed material as it passes over the surface and throws off a spray of fine particle size toward the rotating boot. The particles are positively charged as they pass over the charged disc and are attracted to the boot surface by use of a metal form (Figure 45) inside the boot which is grounded to the conveyor and acts as a target for the particles. The boot is conveyed through a circular shaped ventilated spray booth (Figure 46), which allows the boot to stay a constant distance from the spray disc, and the individual support hooks rotate the boot as it passes through so that the coating is applied as evenly as possible. As the boot exits the spray booth it continues on the conveyor and returns to the starting point, where it is removed from the support hook (Figure 41) and placed in a drying truck (Figure 47).





SECTION A-A'  
SCALE 1/2"=1'-0"



KEY PLAN

RESPECT & GENTLE GUIDANCE

- (C) REFRIGERATOR RINGS SUPPORT STEEL. SEE DRAWINGS  
CORP. Dwg. No. S-24091, SH. 1 OF 1
- (B) SHROUD - FOR DETAILS SEE DRAWINGS CORP.  
Dwg. No. D-24091, SH. 1 OF 2
- (A) FOR GENERAL DESCRIPTION OF COATING &  
SPRAY EQUIPMENT SEE BAUSBUCH CORP.  
Dwg. 24091-B, SH. 1 OF 1

### GENERAL NOTES

Figure 39

**NOTE :**

- DIA OF LOOP - 60" - 22 LBS PER  
 @ BOOTS IN SPRAW POSTS - 22" x 22"  
 12 MIN SPRAW BACK DIST @ 10 G PER MIN  
 @ /MIN. LOW - 20" MIN HIGH

D-9901-34.1 ASSEMBLY ELECTRICITY STARTING  
2. CONTROL SYSTEMS  
3. ROTATION & SPEED CONTROL  
4. CONTROL OF DRUMS  
5. SUB-ASSEMBLY POWER ROTATION

1									

UNIROYAL

**UNIROYAL, Inc.**  
ENGINEERING DEPARTMENT  
MANUFACTURING PLANT  
MANASSAS, VIRGINIA 22060

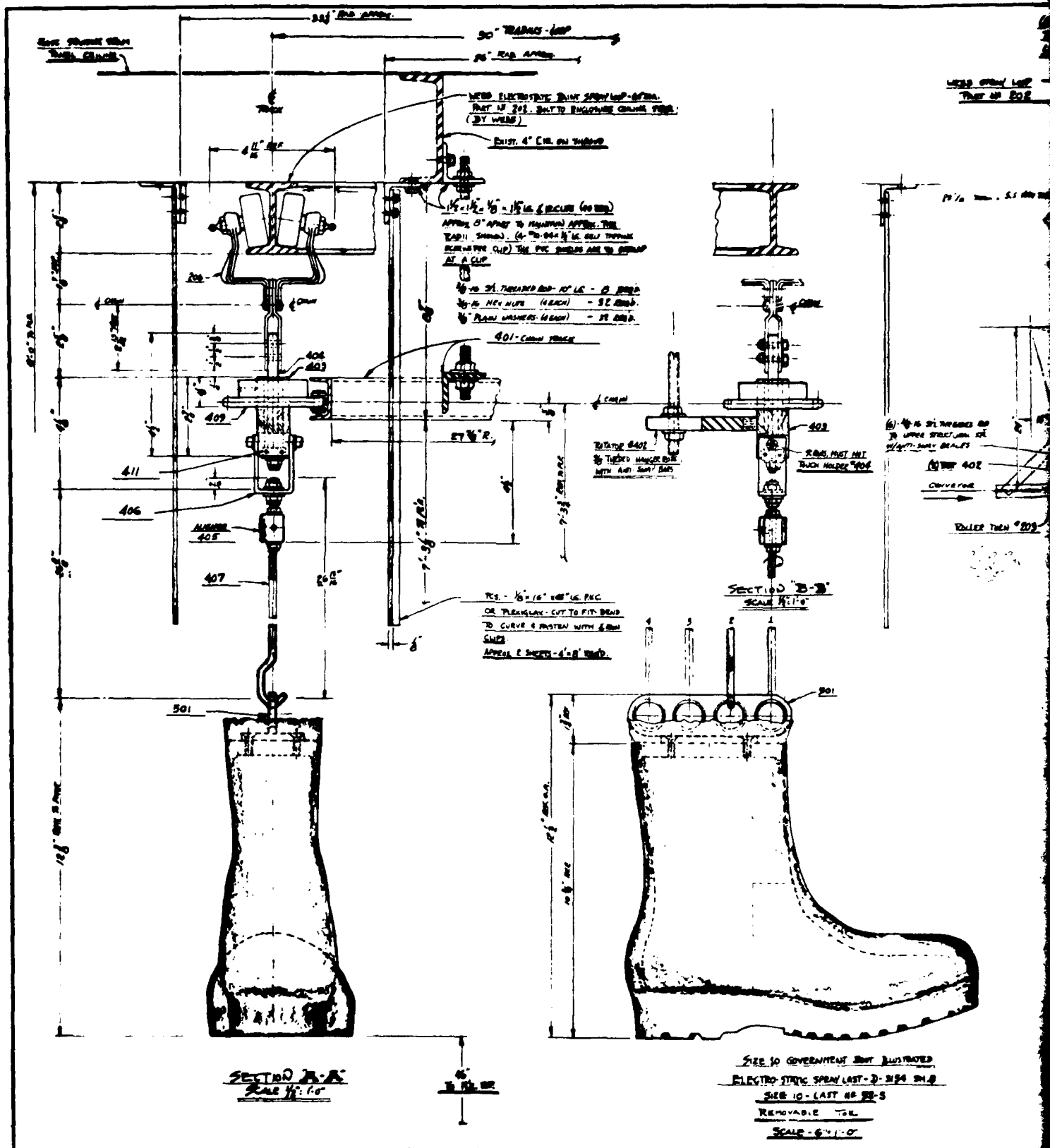
**RANSBURG ELECTROSTATIC SPRAY-  
POLYURETHANE INSULATED  
GOVERNMENT BOAT**

**GROUND FLOOR AREA 625 - RANSBURG CO. 625**

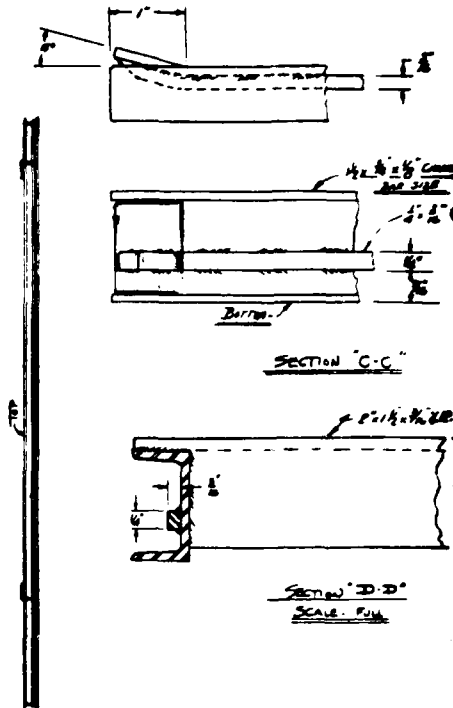
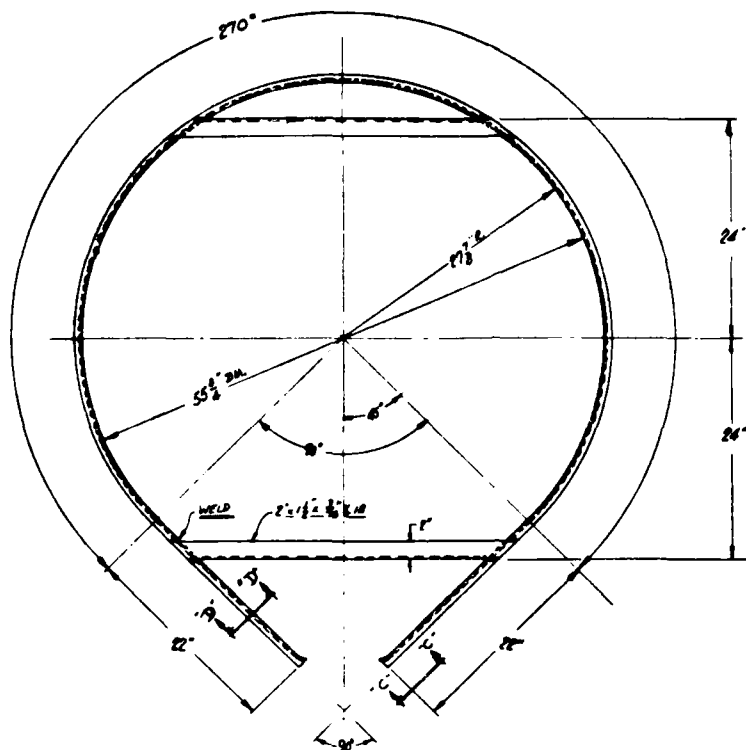
DATE	REV. NO.	REVISION	BY	APP.	DRAWN BY	DATE	TO SCALE BY	DATE	
					TAJ				
CHECKED BY					DATE	APPROVED BY			DATE
SCALE					1" = 1 FT.	SHEET NO. 1			
DWS. NO.					D - 3301				





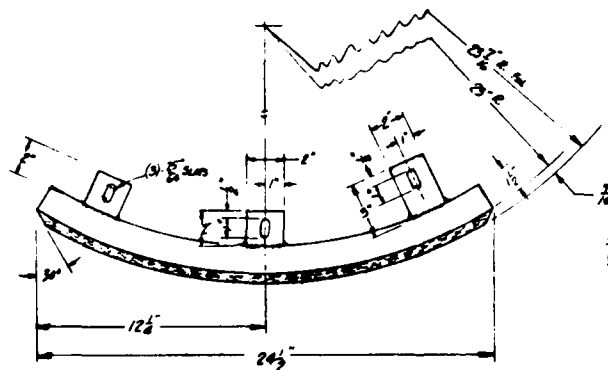






- 22 - 1/2" x 16 x 10 LG. CONTINUOUS THREADED STEEL BAR
- 32 - 3/8" x 16 ST. L. ROD NUTS
- 32 - 3/8" PLAIN WASHERS STL
- 16 - 3/8" LOCK WASHERS

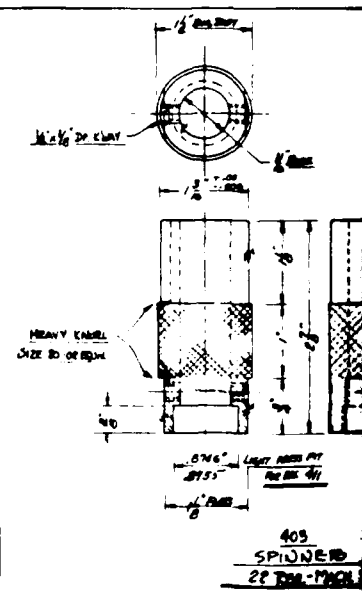
401  
TRACK CHAIN  
1 REQ. - STREET STL.  
BEND & WELD



ALL ELEMENTS f  
1/8" VIBRATING FINISH RODS  
(FROM 1/2" STOCK) - CONCAVE  
SECURELY TO ALUM. BOX -  
(USE WELD IF NECESSARY)

- 6 - 3/8" x 16 LG. CONTINUOUS THREADED STEEL BAR
- 24 - 3/8" x 16 ROD NUTS
- 24 - 3/8" PLAIN WASHERS STL

402  
ROTATOR, FRCTION  
2 REQ. - ALUM. & VIBRATING



403  
SPINDLE  
22 REQ. - MACH.

D-3901

44 - 1/2" x 16 LG. CONTINUOUS THREADED STEEL BAR

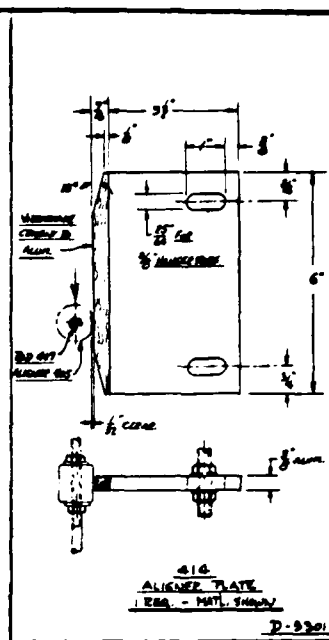
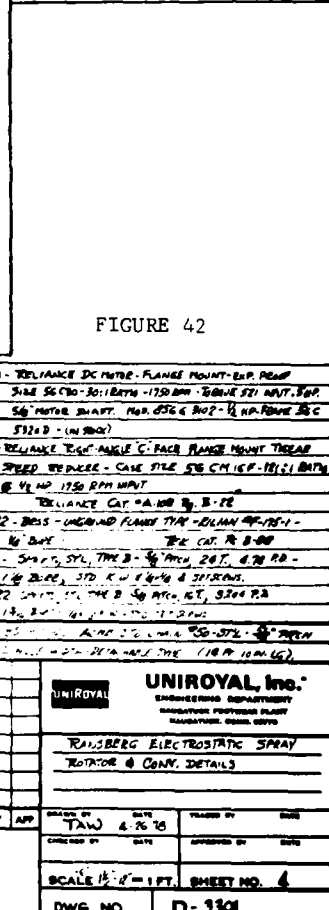


FIGURE 42



**UNIROYAL, Inc.**  
ENGINEERING DEPARTMENT

SAUBATON FOOTWEAR PLANT  
SAUBATON, GERM. DEM. REP.  
BAUBERG ELECTROSTATIC SPRAY

ROTATOR & CONV. DETAILS

SEARCHED BY <b>TAW</b>	DATE <b>4-26-78</b>	INDEXED BY	DATE
---------------------------	------------------------	------------	------

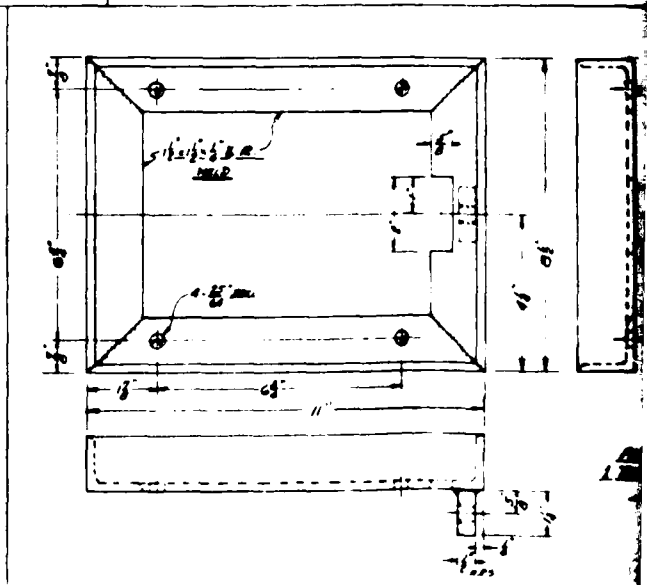
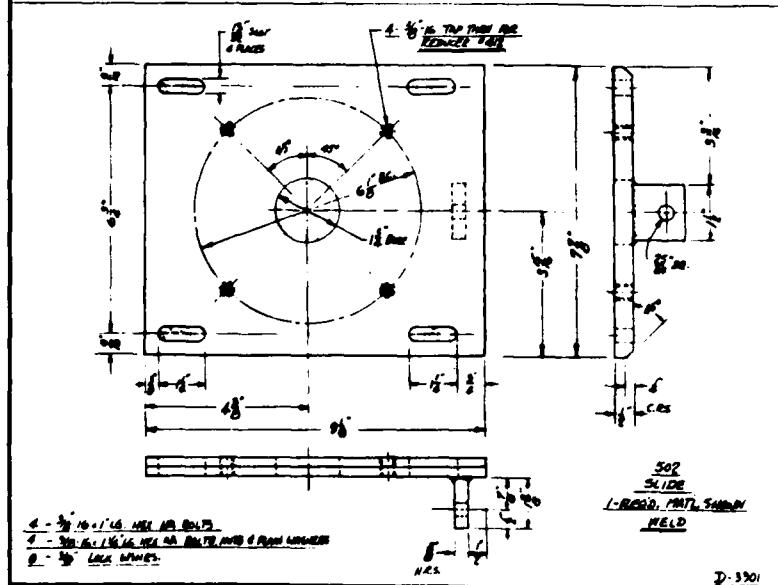
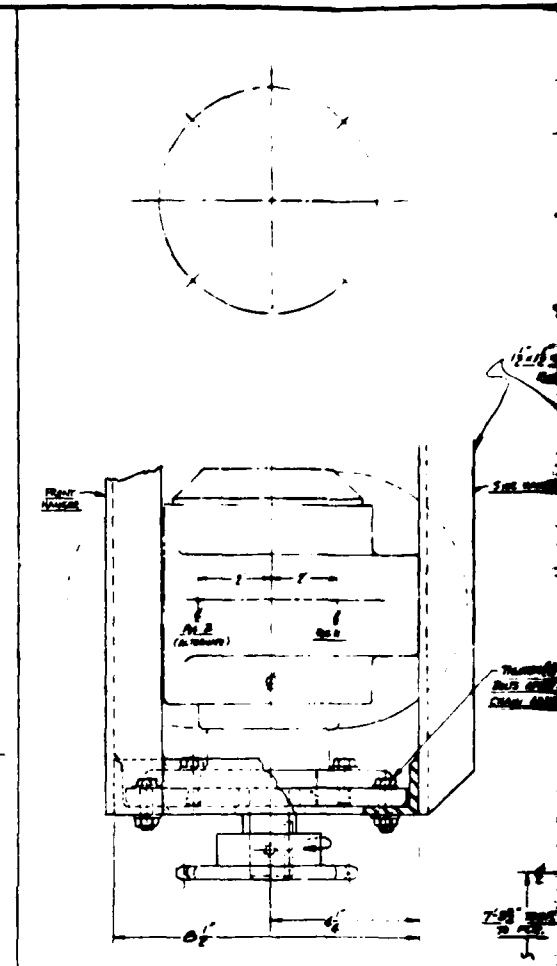
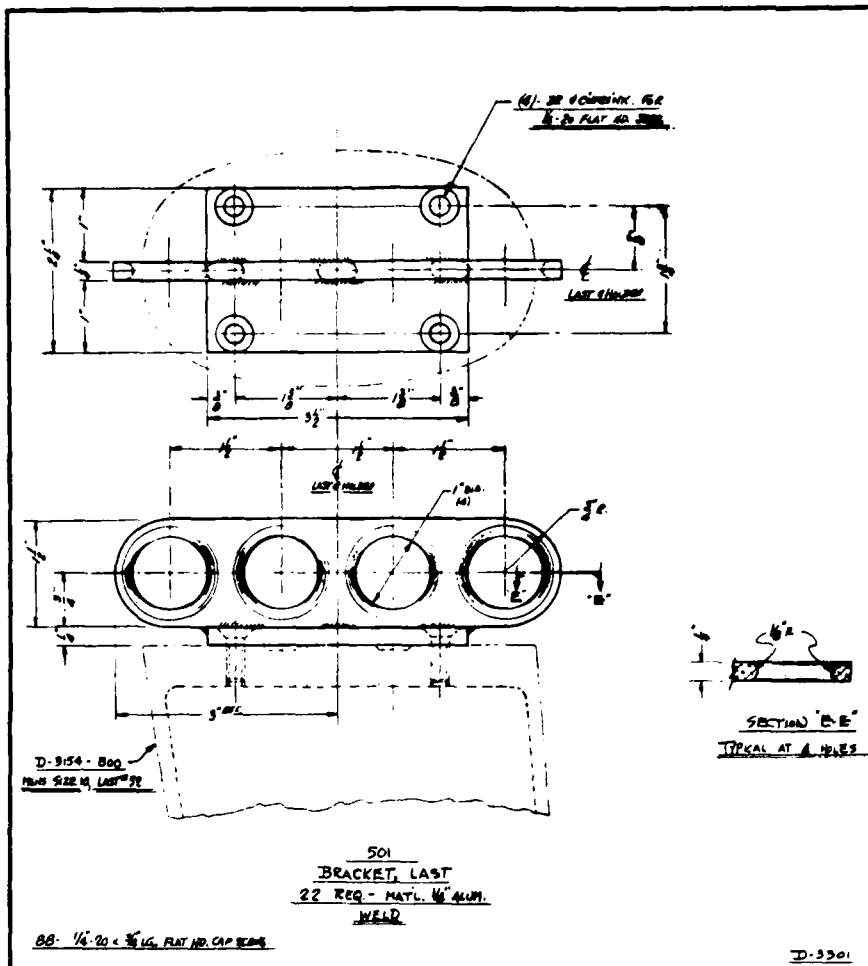
DATE	DATE	DATE	DATE

SCALE 1/4" = 1 FT.	SHEET NO. 4
DWG. NO.	D-3301

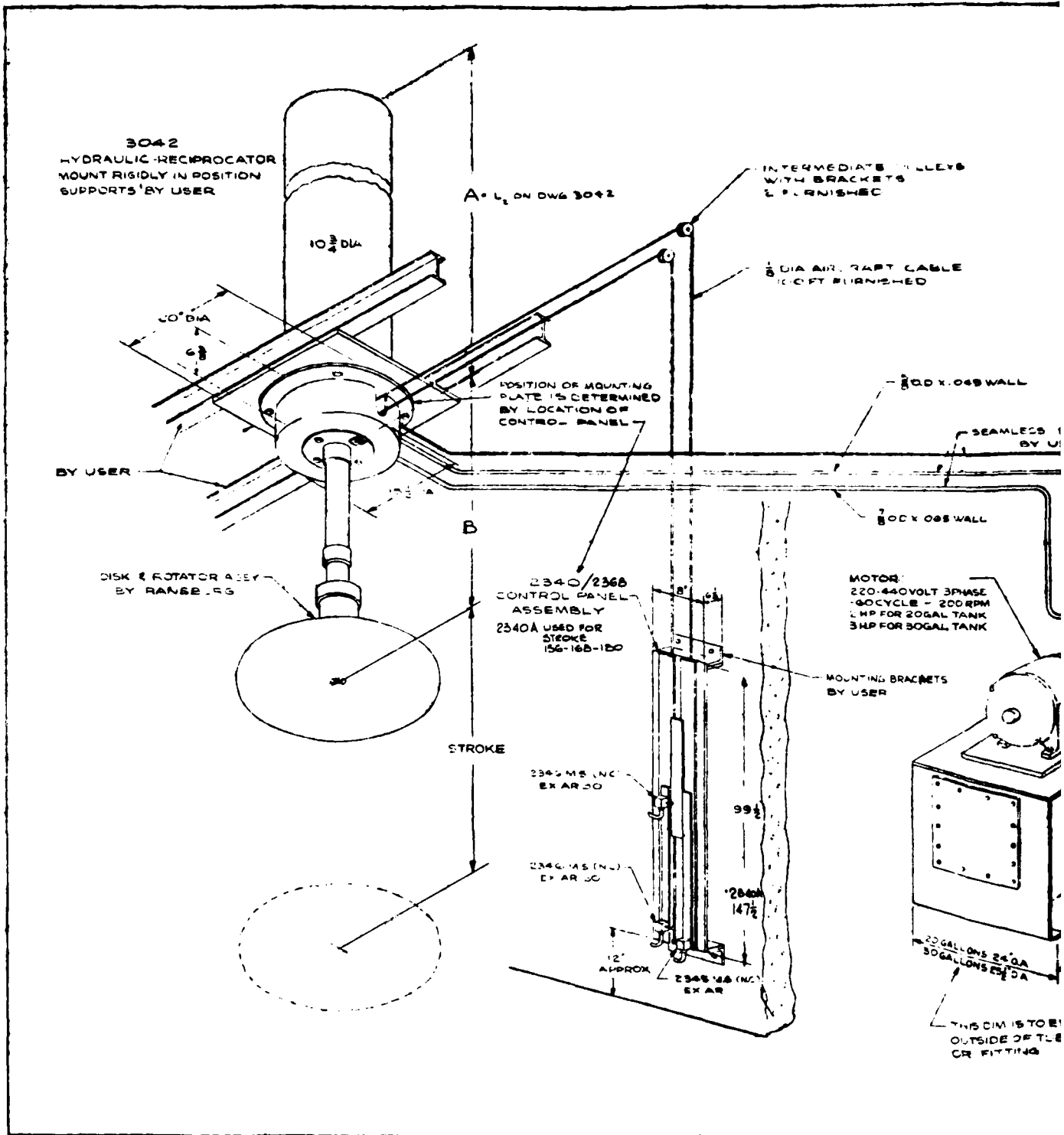
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1. *Journal of the American Medical Association*, 1997; 277: 1033-1036.

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ELECTRICAL LOAD					
- GRADE C PUMP & CONTROLS					
MOTOR & CONTROL		220V		480V	
3 HP		30 AMPS		42 AMPS	
5 HP		40 AMPS		56 AMPS	
WEIGHT OF MODULE APPROX LBS				2369	
SIZE	507	1568	2369	1568	507
1/2"	1110			920	1110
3/4"	1110			920	1110
1"	990		160	920	990
1 1/4"	990		160	920	990
1 3/4"	870		160	870	870
2"	870		160	870	870
2 1/4"	750		170	750	750
2 3/4"	690		170	690	690
3"	630		170	630	630
3 1/2"	570		170	570	570
4"	510	150		500	510
4 1/2"	450	50		500	450
5"	390	150		500	390

DIMENSIONS		
SIZE	A	B
1/2"	23 1/8"	25 3/8"
3/4"	26 1/8"	
1"	20 1/8"	
1 1/4"	18 1/8"	
1 3/4"	16 1/8"	
2"	15 1/8"	
2 1/4"	13 1/8"	
2 3/4"	12 1/8"	
3"	10 1/8"	
3 1/2"	9 1/8"	
4"	7 1/8"	
4 1/2"	6 1/8"	
5"	5 1/8"	
5 1/2"	4 1/8"	55 3/8"

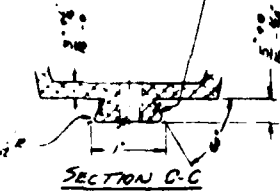
LEE'S MANUFACTURING CORP.	
401 E. 10TH ST. CUCAHY CALIF	
HYDRAULIC RECIPROATOR	
OVERHEAD MOUNTING	
CATALOG	1568-507
INSTALLATION SCHEMATIC	M3135

13/16" CORE HOLE

2-3/16" DRILL WITH

4-1/8" 20 TAP & LOCATE AT AS

DOVETAIL TO BE 1/4" WIDE FOR EASY ASSEMBLY



SECTION C-C

CONTOUR OF LAST TO MASTER LAST

1/2" LETTERS

EXCEPT AS SHOWN

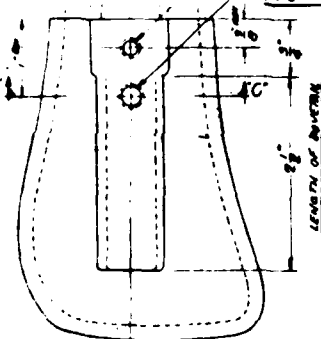
10-52-S

SIZE & LAST NO. TO BE CAST INTO LAST. MUST BE SUNKEN FOR SMOOTH SURFACE

3/8" CORE HOLE

DR. AT ASSEM. WITH SPRING CLIP FOR 1/8" SELF TAPPING SCREW

DR. AT ASSEM. WITH SPRING CLIP FOR 5/16" SELF TAPPING SCREW

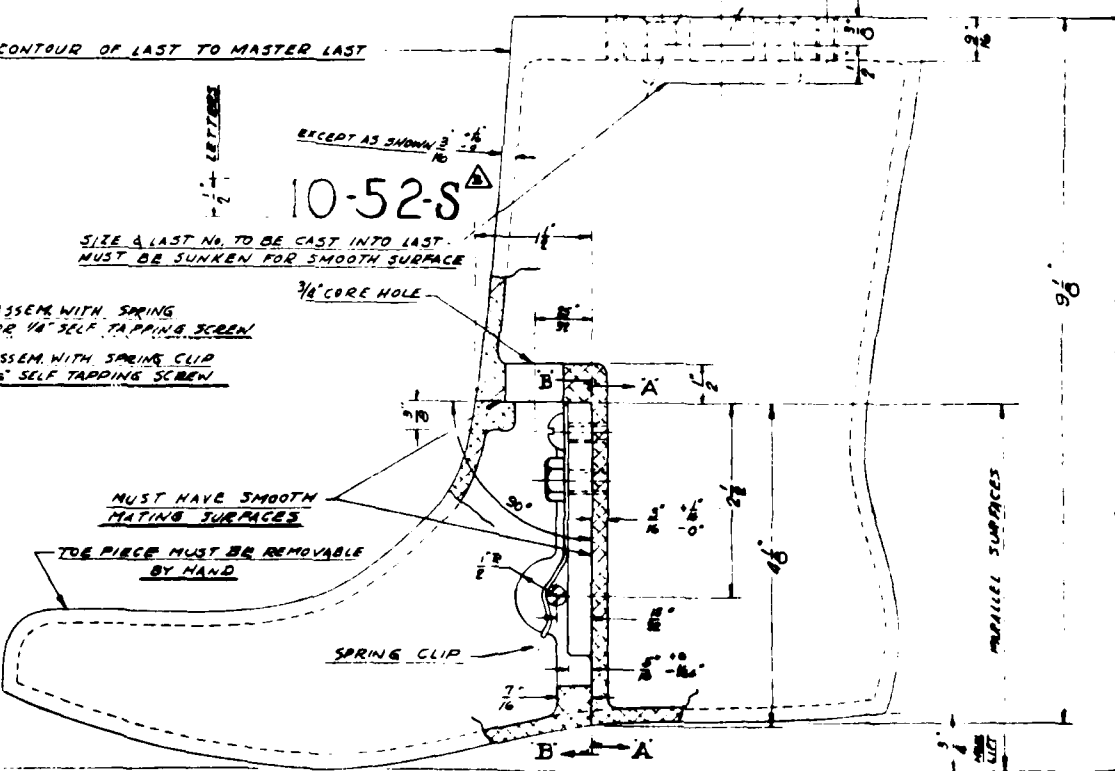


VIEW A-A

MUST HAVE SMOOTH MATING SURFACES

THE PIECE MUST BE REMOVABLE BY HAND

SPRING CLIP



PARALLEL SURFACES

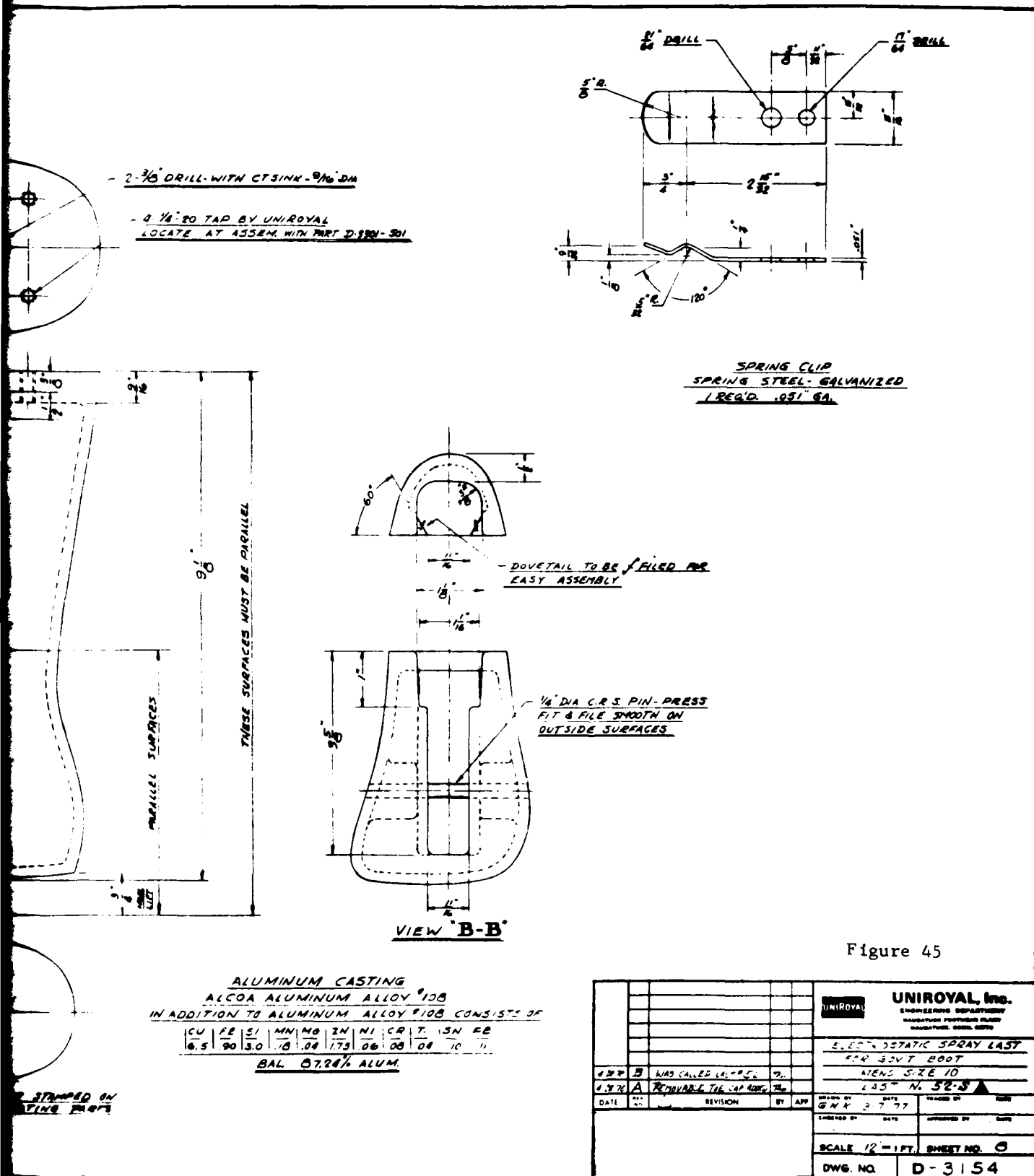
10-52-S

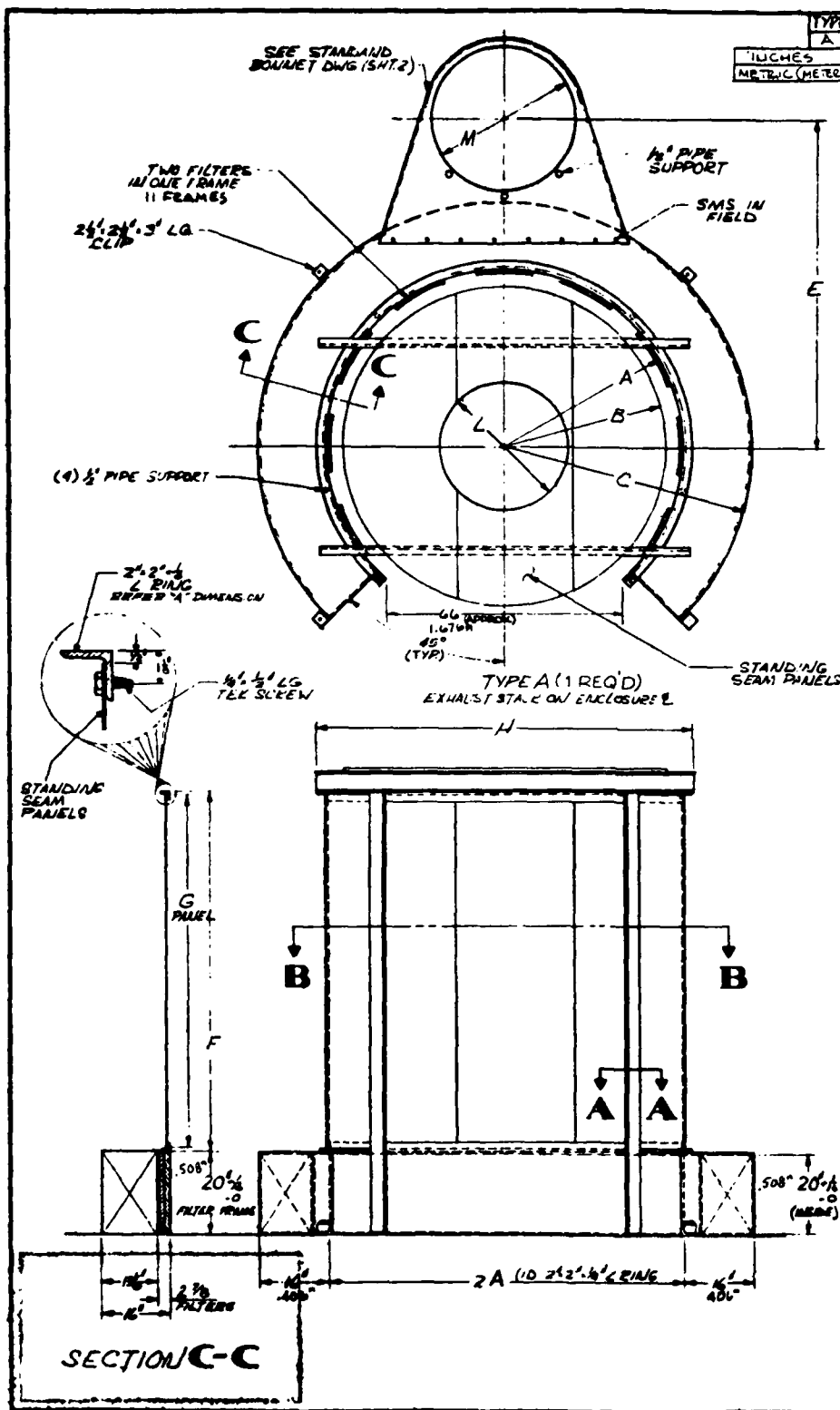
SIZE & LAST NO. TO BE STAMPED ON BAIL OF THE PIECE 3/16" LETTERS

IDENTICAL NUMBERS TO BE STAMPED ON THE SHEL TO IDENTIFY MATING PARTS 3/16" LETTERS

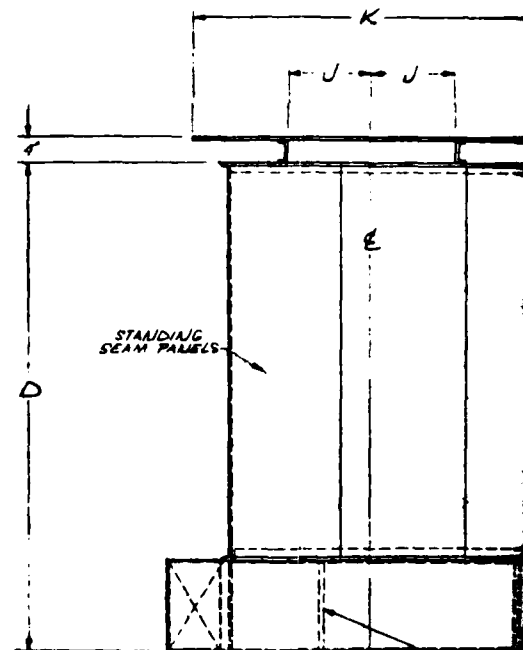
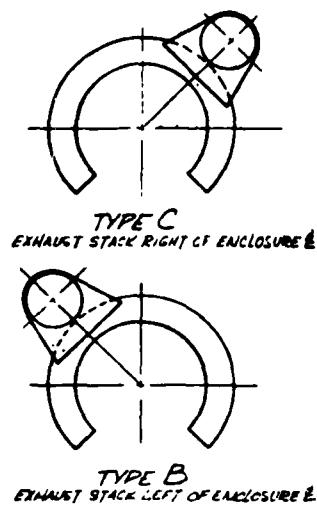
IN ADDITION

CU	FE
0.5	0.8

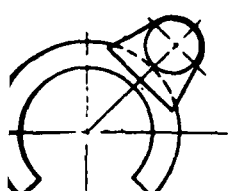




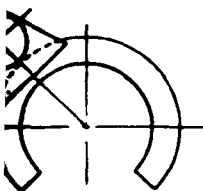
TYPE	ENCLOSURE DIMENSIONS										TOP DISK	
A	A	B	C	D	E	F	G	H	J	K	L	L
INCHES	4 3/4	---	4.4	5.0	5.5	7.2	7.5	3.0	2.4	7.4	3.0	3.0
METRIC (METER)	1.213	---	1.118	1.270	1.402	1.830	1.905	0.762	0.610	1.880	0.762	0.762
MOTOL	REXELAP II PRODUCT - TYPE 11/F FRAME B											
FILTERS	REXELAP II PRODUCT - TYPE 11/F FRAME B											



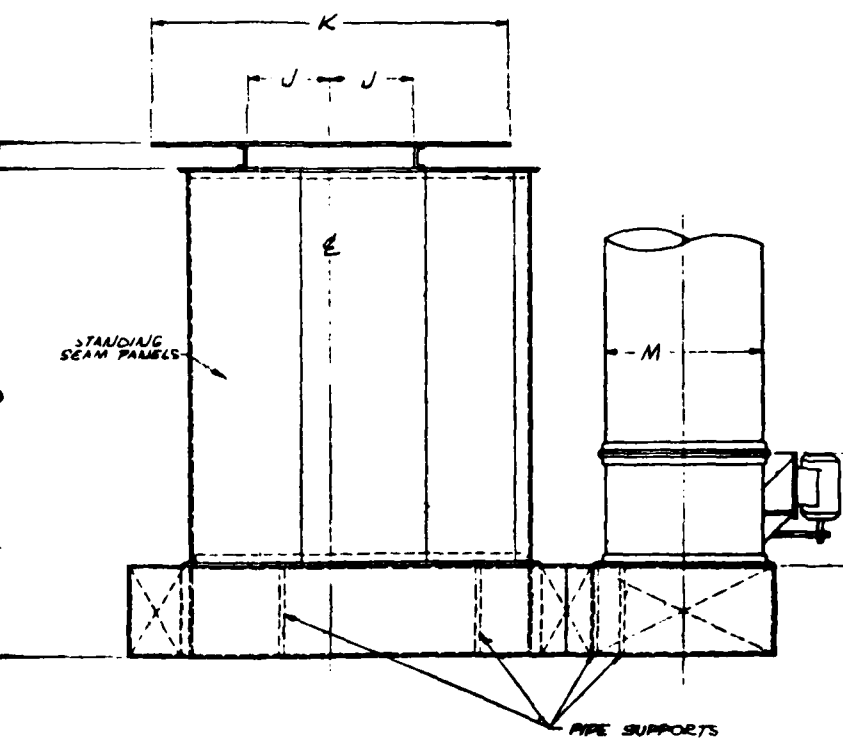
ENCLOSURE DIMENSIONS										TOP DISK		STACK		FAN HEIGHT		1750 HP MOTOR	CFM	NO. OF FILTER FRAMES	
A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U
14.4	3.0	7.5	7.5	3.0	7.5	3.0	7.5	7.4	3.0	24	AD REQD.	1.0	4.0	1.0	1.0	11.0	11.0	11	11
1.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4



TYPE C  
ST. STACK RIGHT OF ENCLOSURE

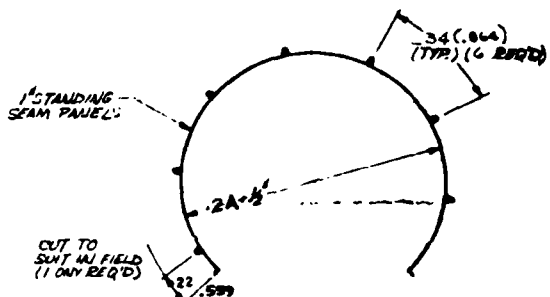


TYPE B  
ST. STACK LEFT OF ENCLOSURE

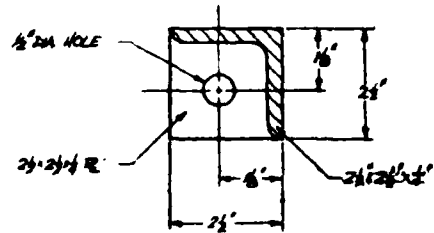


### SHOP NOTES

1. ALL (2) RINGS TO BE 2" x 2" x 1/4"
2. ALL STANDING SEAM PANELS TO BE 18 GA. B.I. ON 34" CENTERS
3. STACKED CAP & SKIRT TO BE 30 GA. ALUMINIZED
4. ALL OTHER SHEET METAL TO BE 18 GA. B.I.



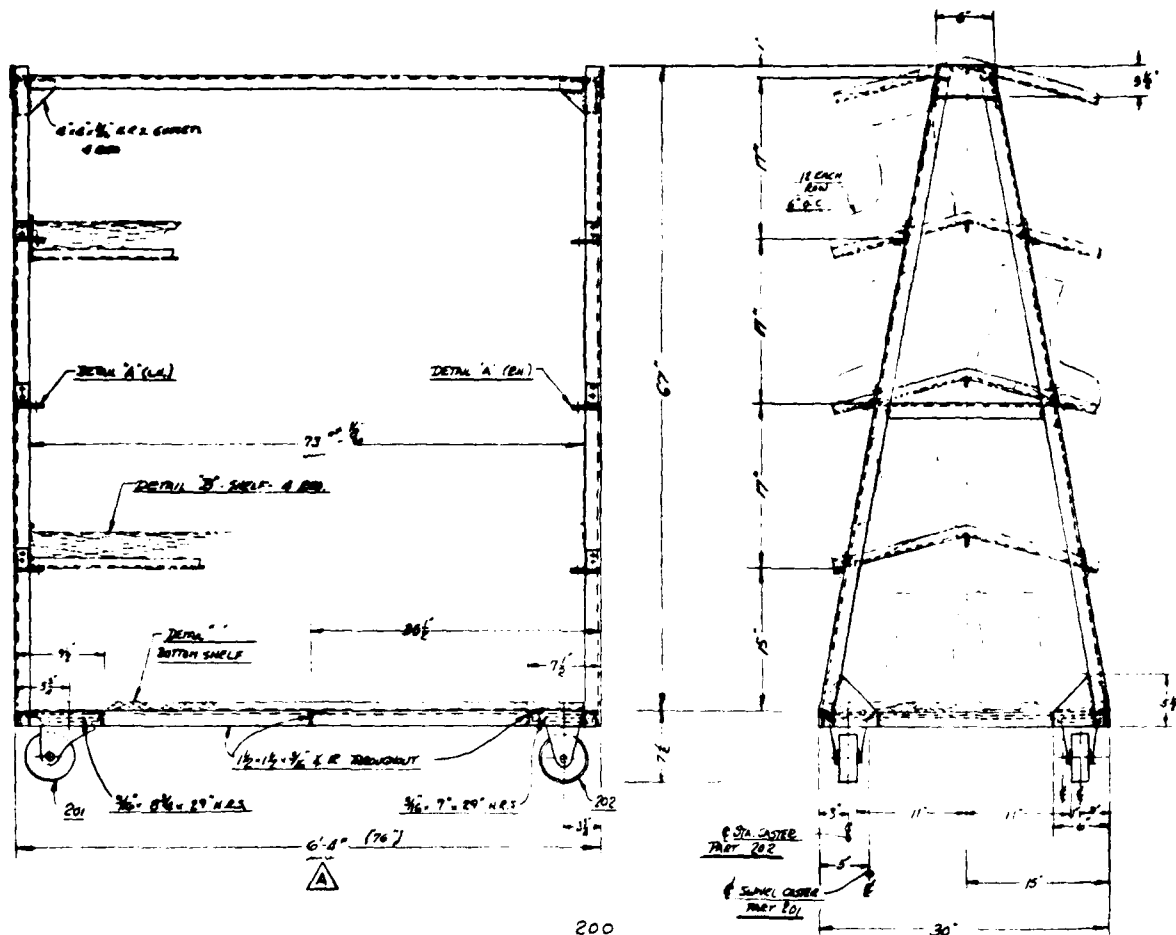
SECTION B-B  
INSIDE DIAMETER ENCLOSURE



SECTION A-A  
FRONT VERTICAL SUPPORT ANGLES  
2-REQ'D (ONE EACH SIDE OF EXTERIORS  
REFER TO DIMENSION)

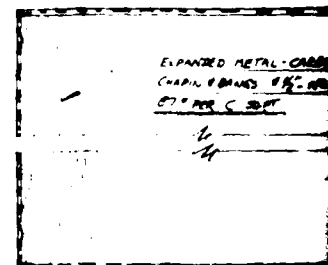
FIGURE 46

DESIGN STATUS		DATE		<b>RANSBURG CORPORATION</b> ENGINEERING DEPT. 1000 UNIVERSITY BLVD. - CONSTRUCTION 1000 UNIVERSITY BLVD. - CONSTRUCTION 1000 UNIVERSITY BLVD. - CONSTRUCTION 1000 UNIVERSITY BLVD. - CONSTRUCTION	
DESIGNED BY	CHECKED BY	DATE	DATE		
DRAWN BY	APPROVED BY	DATE	DATE		
PROJECT NO.		PROJECT NO.			



1. 4 x 4 LK. MAX. NO. BUILT. ANY. FLW.  
2. 8 x 16. 1/4 LK. TO NO. MAX. BUILT. L.W. FLW.

200  
ASSEMBLY  
DRYER TRUCK. GOVT. BOOT  
1 REQ. MAT. SHOWN  
WELD



DETAIL  
SHELF - 2  
1 REQ. MAT.

2. 40 N. 1/4 LK. TO NO. MAX. BUILT. L.W. FLW.



This 60 pair boot truck is pushed into an oven (Figure 48) for curing and heat soaking for solvent removal.

B. Detailed Equipment Requirements

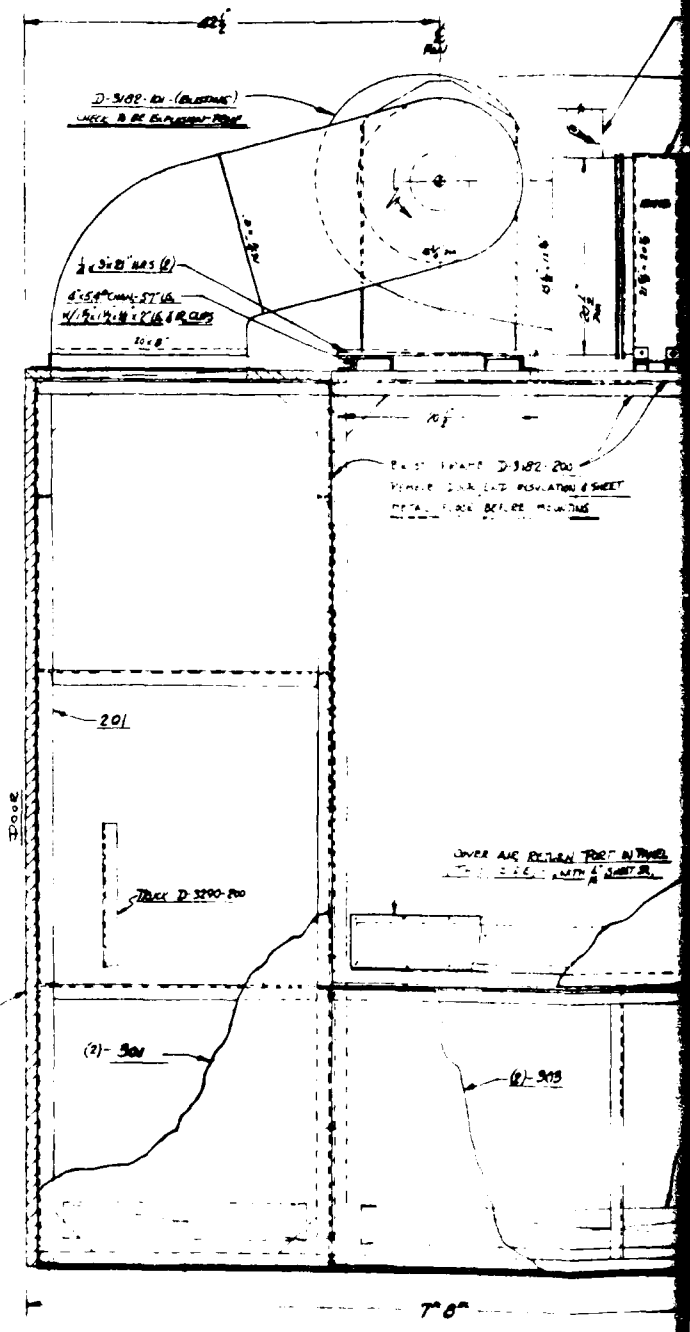
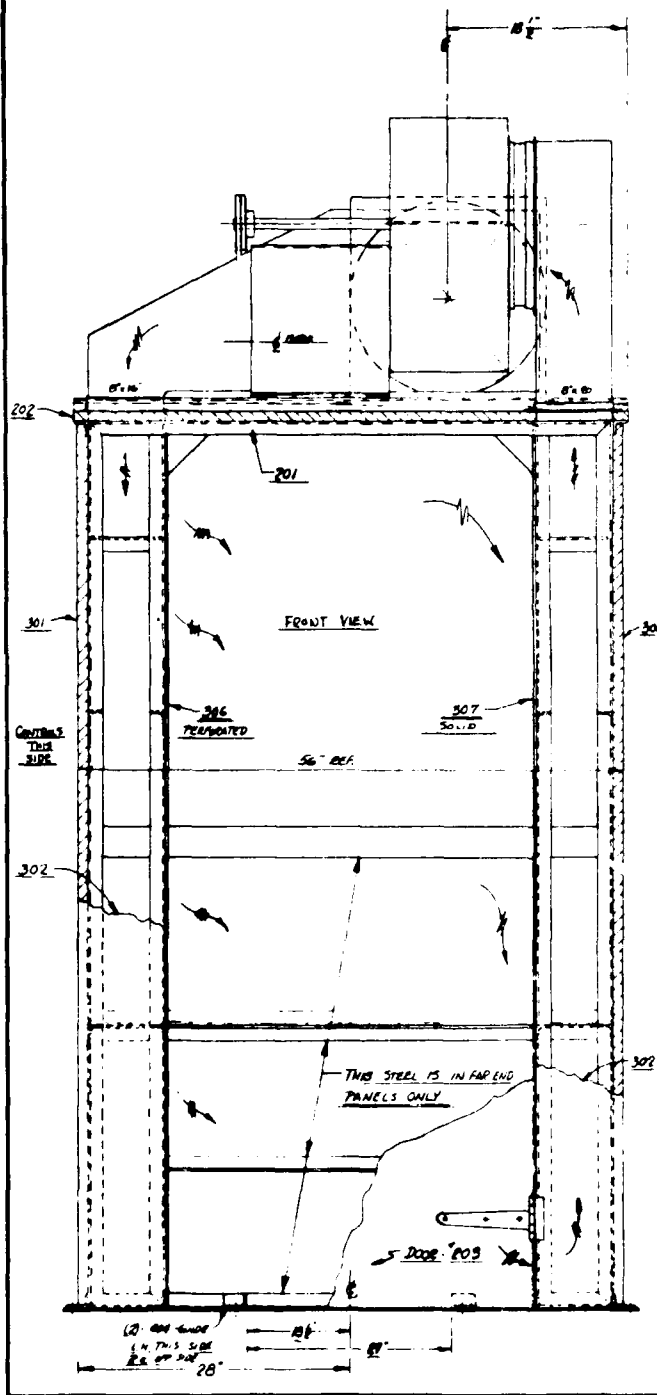
1. There is a pump and drive assembly, (Figure 49 and 50), for both the "A" and "B" component compounds for the outer skin. They consist of a positive displacement gear pump, (Figure 51) and a D. C. motor drive. The D. C. motor operates over an approximate speed range of 45-1750 RPM. This speed is geared down 3:1 allowing the gear pump to rotate at about 15-500 RPM. The gear pump, delivers 1.2 cc/rev. of the pump shaft. The pumps are supplied by 10-gallon agitated supply tanks (Figure 52), that are slightly pressurized to assure a constant supply to the gear pumps:

There is a pressure differential switch attached to each pump unit. These switches monitor the output pressure of the pump and emit an electrical signal to the ratio controller. The differential settings assure the proper output from each pump and cause the system to shut down in the event the ratio falls out of limits.

2. SCR Speed and Ratio Controls

The control panel, (Figures 53), and two motor controllers for the "A" and "B" components control

NOTE: CHANNEL  
TO SUPPLY



D-302-EN (BUSHING)  
UNLESS SHOWN OTHERWISE

2 (3x12) HAS (2)  
8x54" CHANNEL STUBS  
W/ 1/2" x 1/2" x 8" CLIPS

PAINT FRAME D-302-200  
VENTILATION INSULATION SHEET  
DETAILS BEFORE MOUNTING

DOOR AND RETURN PORT IN PANEL  
TO BE LOCATED WITH A SHORTER



ITEM NO.	P. C. PART NO.	DESCRIPTION	QTY.
1	2451-00	SPRING	1
2	7486-15	WASHER - PLAT 510	1
3	7793-00	TERMINAL - 8'45 TONGUE	1
4	7750-00	WIRE	13'
5	9561-00	END FITTING	1
6	19800-00	INSULATING SUPPORT	1
7	7957-21C	SCREEN CAP-HEX HD 1/8-16 X 1/2	1
8	7750-12	LOCKWASHER, MED. 1/8	1
9	19537-01	NO. 1, ROUND JUNCTION	1
10	2404-39	LONG RIPLE 3/8 X 1/2	1
11	996-01	MOTOR	1
12	2404-40	LONG RIPLE 1/2 X 1/2	1
13	17983-00	BRACKET	1
14	19850-00	BRACKET L&D	1
15	10049-00	WIRE PLAINERS	AS SHOWN
16	7556-04	REDUCING COUPLING 1/2 X 3/4	1
17	99545-00	SWITCH ADPTE	1
18	7458-24C	SCREEN CAP-HEX HD 1/4-20 X 5/8	4
19	7755-12	NUT HEX 1/4	4
20	7967-00	LOCKWASHER, MED. 1/4	4
21	7775-00	SET SCR.	1
22	7856-10	KEY	1
23	8156-20F	SCREEN-HEX HD CAP	2
24	7756-07	LOCKWASHER, MED. 5/16	2
25	1835-00	TUBE SUPPORT HST.	1
26	2655-00	SHAFT, DRIVE	1
27	13424-04	TIE WRAP 7 1/8 LB X 5/16 RIFL.	1
28	18977-00	NAMEPLATE	1
29	7612-12	SCR. DRIVE	6
30	19089-00	BRACKET, PUMP MOUNT	1
31	11551-24	GEAR 24 TOOTH - SPUR 16-14 1/2	1
32	8168-00	SET SCR. 1/4	4
33	4048-72	GEAR 72 TOOTH - SPUR 16-14 1/2	1
34	19180-00	FITTING - #12 X 1.5 METRIC	5
35	19181-00	BUSHING METRIC 3 DECIMAL	1
36	8187-01	COVER, PUMP	1
37	7750-12F	SCR-RO HD 810	1
38	1017-00	FITTING, HOSE 1/4 NPT - 1/4 NPS	1
39	13649-02	TEE - 1/4" BRANCH	1
40	19099-00	PUMP-BARRAGE SW 74 A	1
41	7958-32C	SCR. CAP HEX HD 1/4-20 X 1	2
42	13608-00	BAND CLAMP	1
43	19198-00	CONTAINER	1
44	7597-02	ADAPTER-SWIVEL	1

1. CRITICAL DIMENSIONS ARE 1.0  
 MAJOR DIMENSIONS ARE 4.0  
 ALL OTHERS ARE  
 DECIMALS 0.5  
 FRACTIONS 1/8 ANGLES 10.0

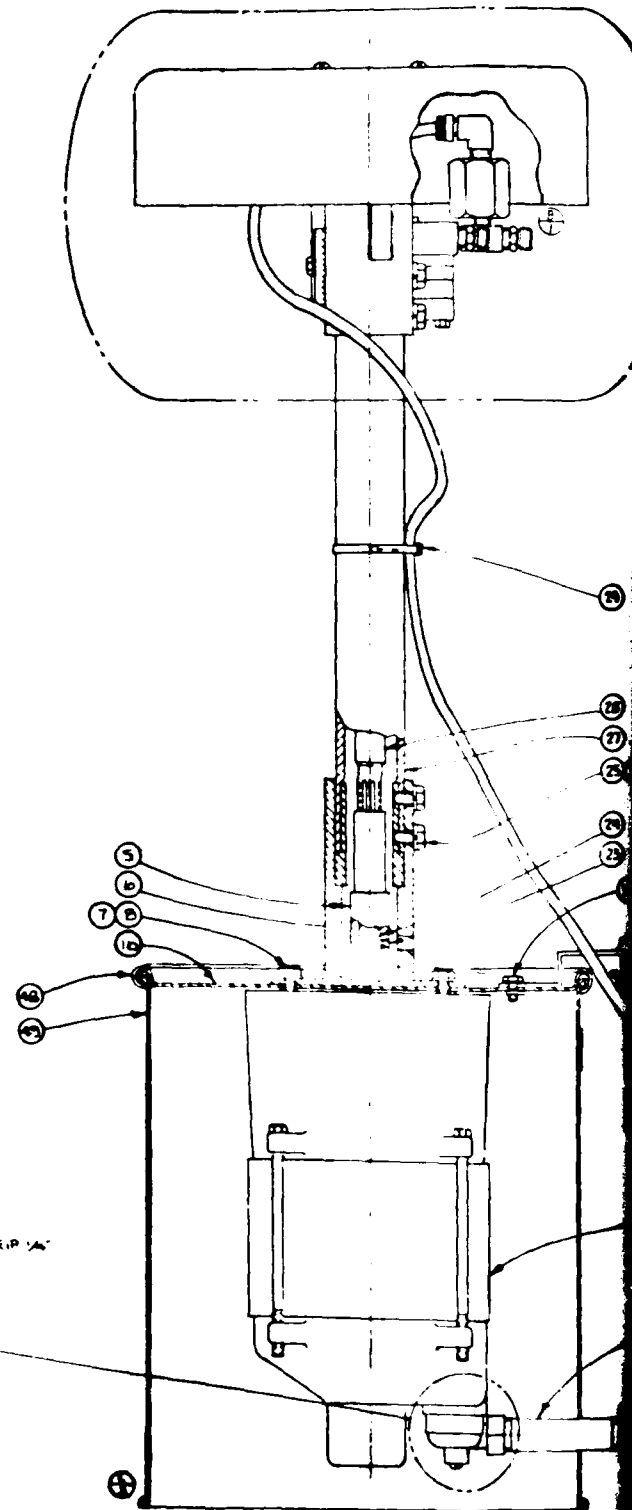
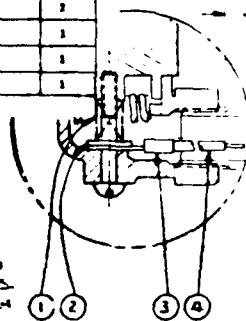
2. SURFACE FINISH:  
 MACHINED SURFACES - 32  
 CAST SURFACES - 250

3. SHARP EDGES AND MAX.  
 RADIUS TO BE 0.04 MAX. R

4. TOLERANCES:  
 FRACTIONAL DIMENSIONS - ± 1/64  
 DECIMAL DIMENSIONS - ± .005  
 ANGULAR DIMENSIONS - ± 1°

NOTES: UNLESS OTHERWISE SPECIFIED

MARKER DASHES TO  
 CORRELATE WITH NO.  
 OF MOTOR AND SWITCH  
 Wires.



19092

REV	DESCRIPTION	DATE	APP	BY
A	REL FOR MFG			
B	REV PICTORALLY (1) WAS 24C 3) WAS 29 (1) WAS 10 5) WAS 3347-02 6) REM ITEM 3347-22 7) REV PICTORALLY (SHT 2)	7/74	APP	6750
C	1) REMOVED 7205-00 2) REMOVED 6548-00 3) REV PICTORALLY	7/74	APP	6895

FOR DETAIL - SEE SHT 2

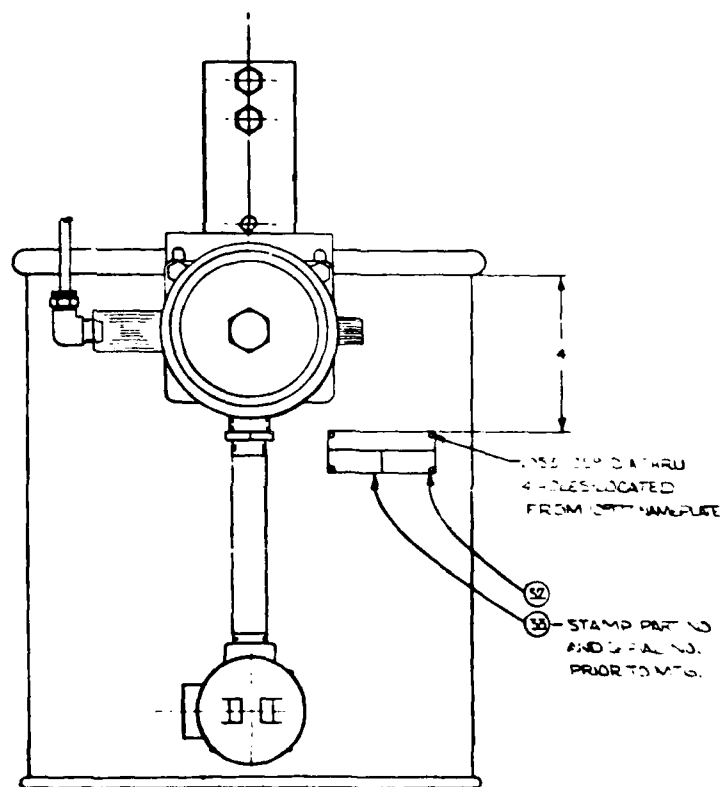
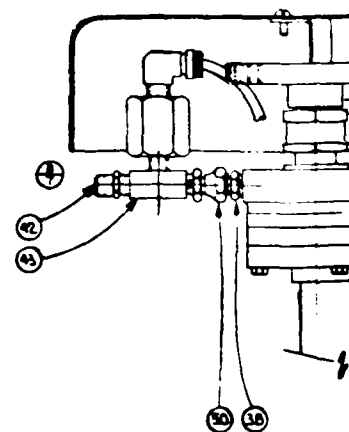
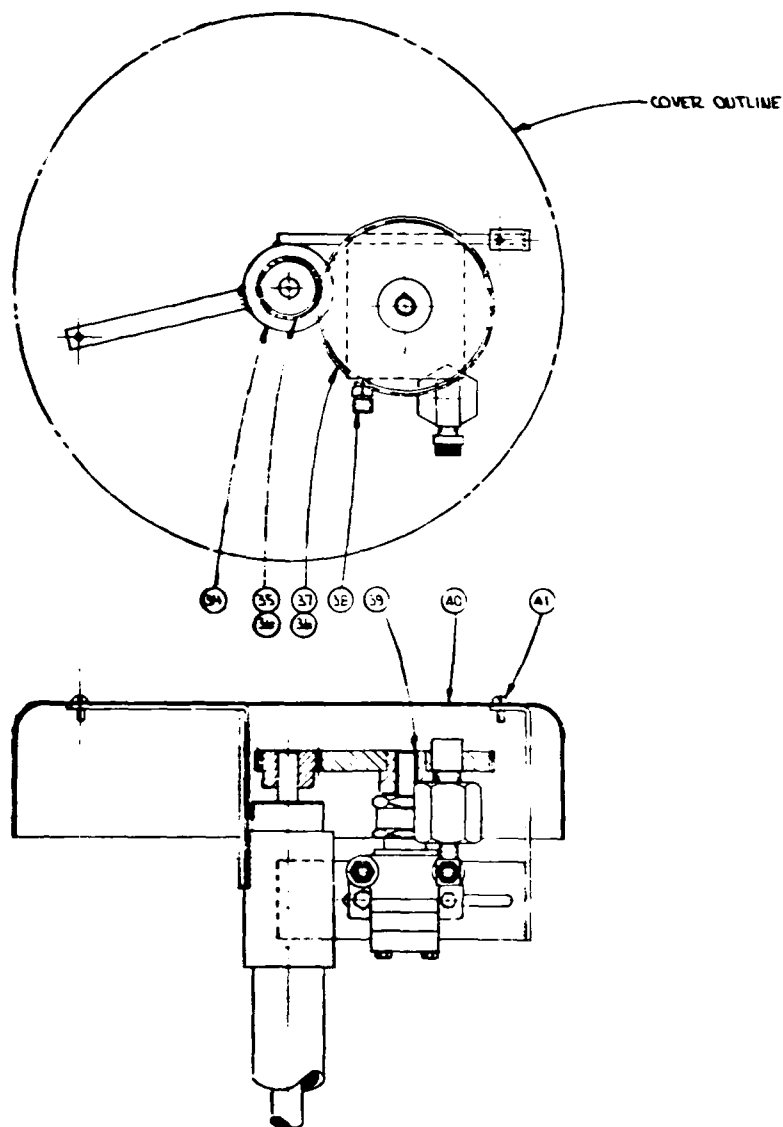


FIGURE 49

DESIGNED BY		DRAWN		CHECKED		RANSBURG CORPORATION	
APPROVED		RELEASED		FOR MFG		INDIANAPOLIS, IN.	
DATE	APP	DATE	APP	DATE	APP	TITLE 2 COMPONENT PUMP ASSEMBLY	
						19092	

12



- 4 - 1/2 LEVEL  
 CRITICAL  $\oplus$  IS 1.0  
 MAJOR  $\oplus$  IS 4.0  
 ALL OTHERS ARE  
 MINORALS 0.5  
 FRACTIONS & ANGLES 10.0
- 5 SURFACE FINISH  
 MACHINED SURFACES -  $\nabla$   
 CAST SURFACES -  $\nabla$
- 6 BREAK SHARP EDGES 0.05 MAX  
 FILLETS TO BE 0.05 MAX R
- 7 TOLERANCES  
 FRACTIONAL DIMENSIONS -  $\pm$  1/64  
 DECIMAL DIMENSIONS -  $\pm$  0.05  
 ANGULAR DIMENSIONS -  $\pm$  2°  
 UNLESS OTHERWISE SPECIFIED

0

19092

APP	REVISION	DATE	APP	S.C.
A	REL. FOR LIFE	10/10/60		

SEE SHEET NO. 19091 FOR  
C IS LATEST REVISION OF THIS SHEET

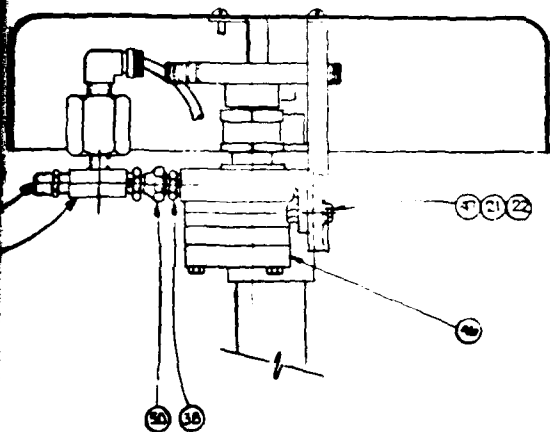


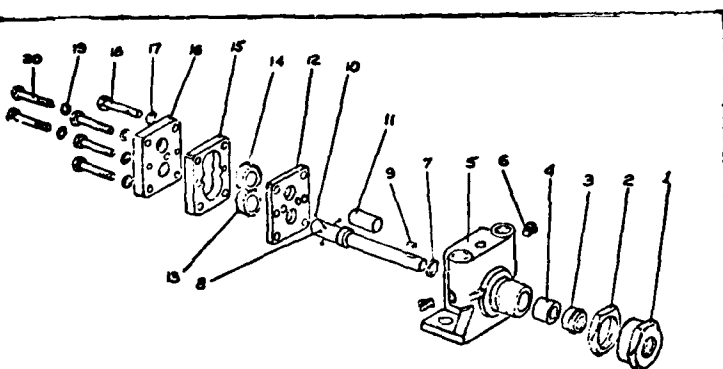
FIGURE 50

D

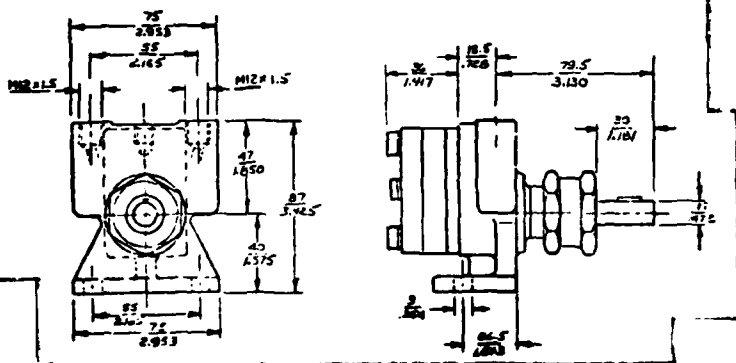
DESIGNED BY		DATE	10/10/60	<b>RANSBURG</b> <b>CORPORATION</b> BOSTON, MASS. 02108
CHECKED BY		DATE	10/10/60	
APPROVED BY	DATE	DATE		TITLE 2 COMPONENT PUMP ASSEMBLY RESIN
SCALE	1-2	DATE		SHEET NO. 19092



REV.	REVISION	DATE	APP.	E.C.
A	REL FOR MFG	6-4-78	MM	OTW



19099

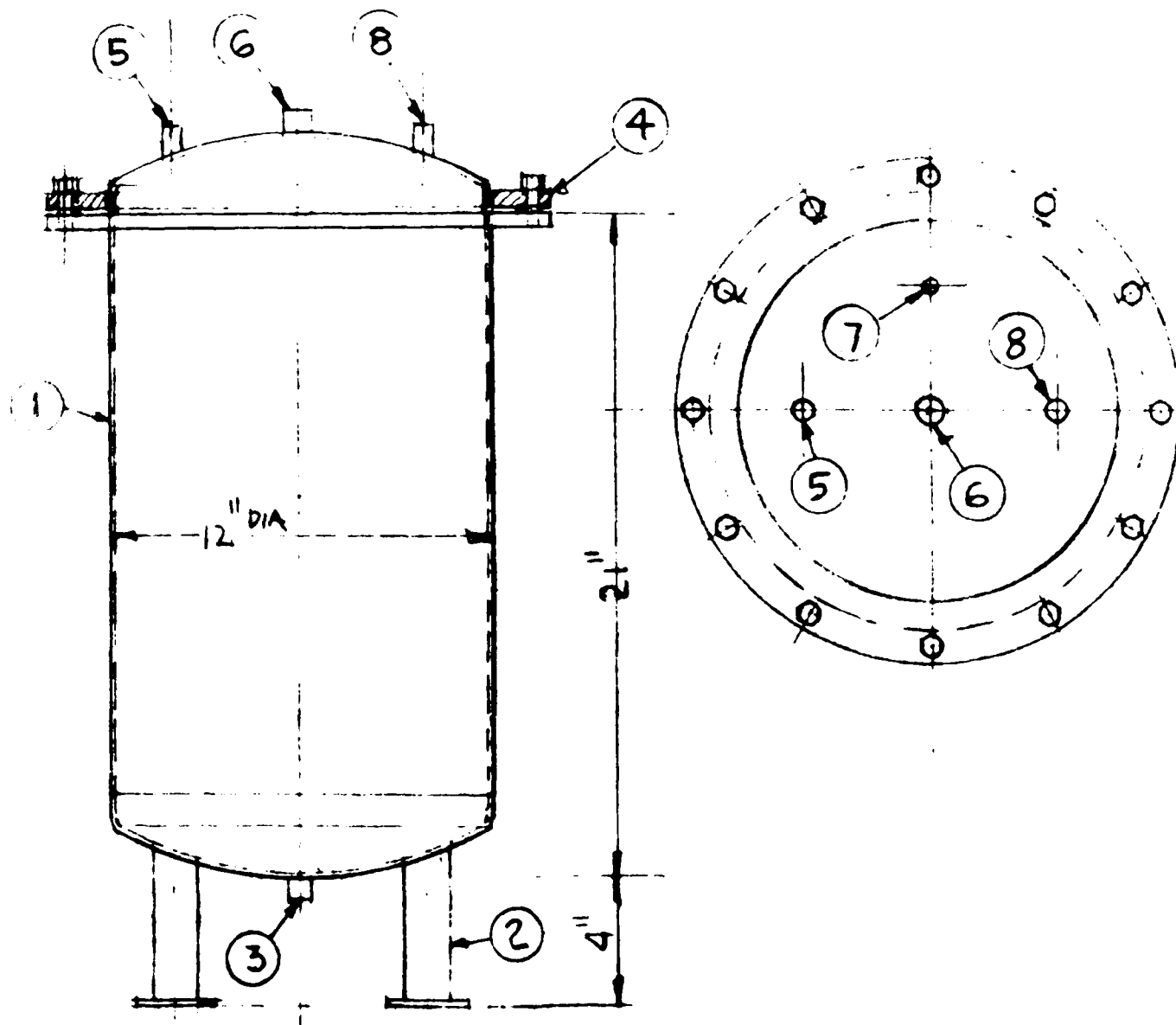


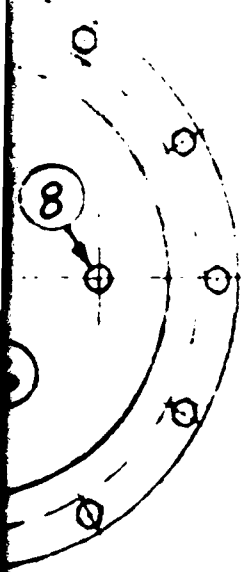
SV 74A PUMP DIMENSIONS - MILLIMETERS OVER INCHES

FIGURE 51



DRAWING STATUS		DRAWN 1 BELL		RANSBURG CORPORATION	
CONFIDENTIAL		6-25-78			
RELEASED FOR MFG		CHECKED BY S. J. 778 & B. B. 6-25-78		NEXT APP. STD.	
DEV.	APP.	DATE		TITLE PUMP BARRIAG SV 74A 1.2 CC/REV.	
FUCK		SCALE		19099	



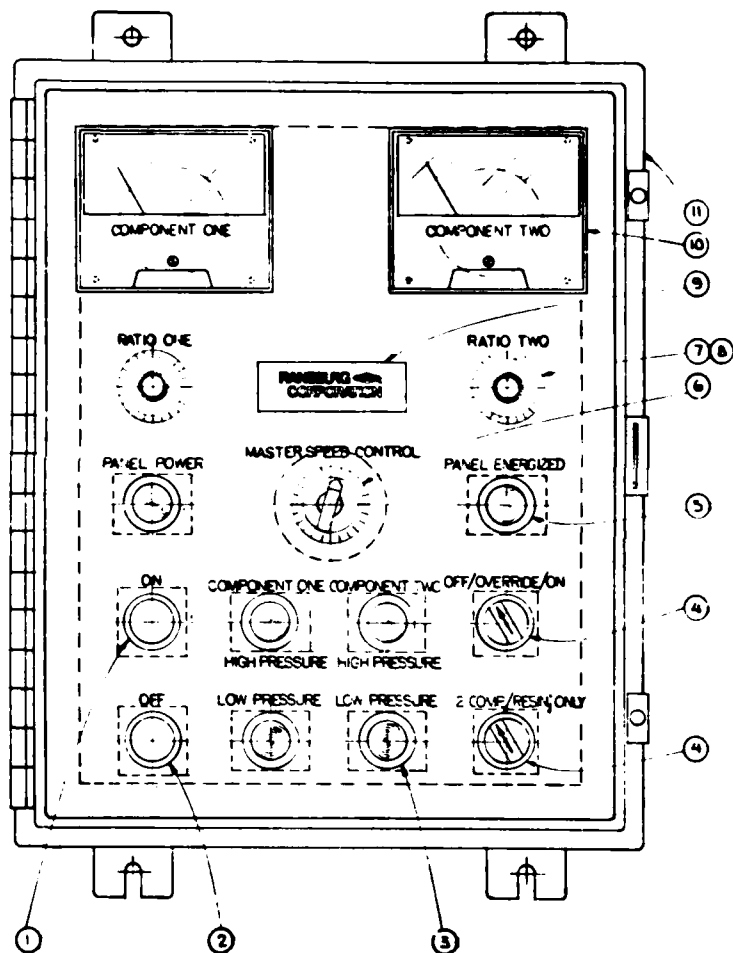


Pc No	LIST OF PARTS	SIZE
1	TANK - STAINLESS STEEL TYPE 316	10 GAL CAP.
2	LEG	
3	OUTLET - COUPLING	1/2" IPS
4	FLANGE	
5	COUPLING - RELIEF VALVE	1/2" IPS
6	COUPLING - AGITATOR	3/4" IPS
7	COUPLING N2	3/8" IPS
8	COUPLING - FILL	1/2" IPS

FIGURE 52

STORAGE TANK 10 GALLON CAPACITY	
ALL WETTED SURFACES TYPE 316 SS	
THE ELECTRIC HEATER CO. STRATFORD, CONN.	
(2) Req	DWG NO 78-2087-3

ITEM NO.	P.C. PART NO.	DESCRIPTION	QTY
1	11255-6	PUSH BUTTON FLUSH HEAD GREEN	1
2	11255-8	PUSH BUTTON EXTENDED HEAD RED	1
3	11255-47	PILOT LIGHT ASSY. RED LENS	1
4	11255-4	SELECTOR KNOB-ROTARY 2-POS.	2
5	11255-48	PILOT LIGHT ASSY. BLUE LENS	1
6	9685	VARIABLE TRANSFORMER	1
7	13683	DIAL 3 TURN	2
8	19148-01	POTENTIOMETER 3-TURN SHORT SHUNT	2
9	9100	NAMEPLATE TRADEMARK	1
10	19149	METER RPM 0 TO 650	2
11	19046	BOX MACH & SCHEDULED	1
12	6655	NAMEPLATE - CONTROL PANEL	1
13	7612-22	SCREW, DRIVE, RD. HD. TYPE V C&D. PL.	6
14	19151	INNER PANEL	1
15	14684	RELAY 120 V.A.C.	5
16	15570	SOCKET - SCR. TERMINAL	5
17	7747-18C	SCREW - RD. HD. 16-32 X 1/2	7
18	7755-12C	SCREW - RD. HD. 18-32 X 5/8	5
19	7987	TERM. BLOCK COMP. END	2
20	7988	TERM. BLOCK COMP. CONTACT	56
21	7567-1	EXT. TOOTH LOCKWASHER	1



4. AS LEVEL.  
 CRITICAL  $\pm 0.0$   
 MAJOR  $\pm 0.0$   
 ALL OTHERS ARE:  
 DECIMALS 0.0  
 FRACTIONS & ANGLES 10.0

2. SURFACE FINISH:  
 MACHINED SURFACES -  $\sqrt{16}$   
 CAST SURFACES -  $\sqrt{250}$

3. BREAK SHARP EDGES 0.005 MAX.  
 FILLETS TO BE 0.005 MAX. R

1. TOLERANCES:  
 FRACTIONAL DIMENSIONS -  $\pm 1/64$   
 DECIMAL DIMENSIONS -  $\pm 0.005$   
 ANGULAR DIMENSIONS -  $\pm 1'$

NOTE: UNLESS OTHERWISE SPECIFIED



19115

REV	DESCRIPTION	DATE	APP	BY
A	REL FOR 1915			
B	WAS 276-7			

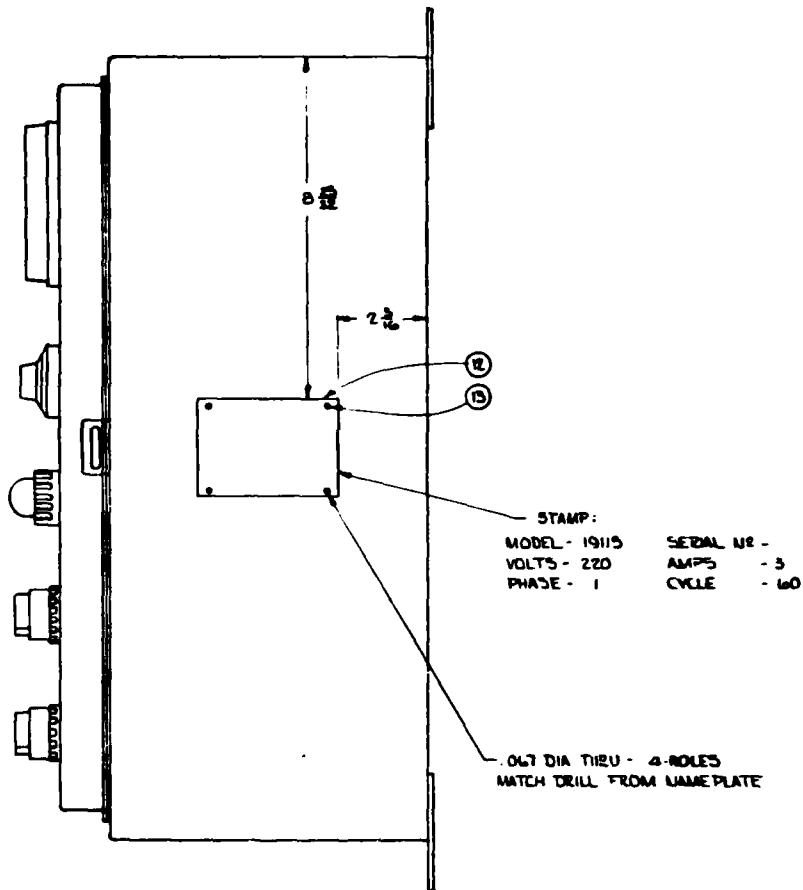
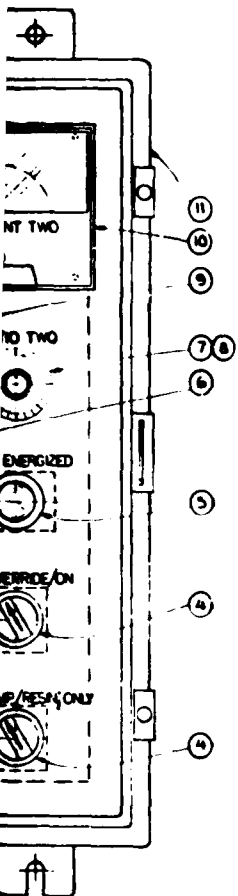




FIGURE 53

DRAWING STATUS			DRAWN		<b>RANSBURG CORPORATION</b> CHICAGO, ILL.
CONFIDENTIAL			CHECKED -		
RELEASED FOR INFO.			THIS APP.		
REV'L. L.S. FILED.			REV'L.		
SCALE			NEXT ASSY		TITLE CONTROL PANEL ASSY 19115

- ① TERMINALS ON 17264 CONTROL PANEL
- ② PIN NO. ON PLUG-IN COMPONENTS
- ③ TERMINALS ON 19095 PUMP CONTROLLERS
- ▷ EXTERNAL JUMP OR BELL 25 VA MAX (BY USER)

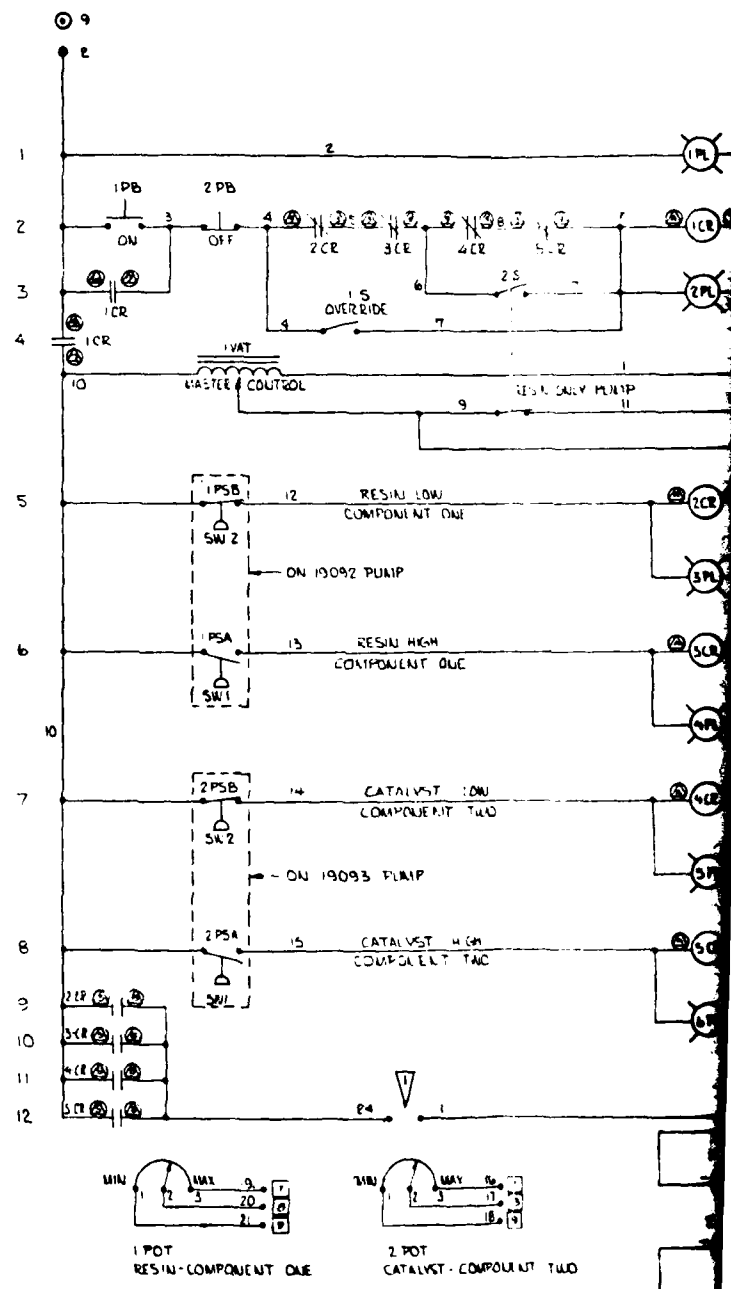
4 AS LEVEL  
 CRITICAL ① IS 1.0  
 MAJOR ② IS 4.0  
 ALL OTHERS ARE  
 DECIMALS 0.5  
 FRACTIONS & ANGLES 10.0

5 SURFACE FINISH  
 MACHINED SURFACES -   
 CAST SURFACES - 

6 BREAK SHARP EDGES 0.05 MAX  
 FILLETS TO BE 0.05 MAX R

7 TOLERANCES  
 FRACTIONAL DIMENSIONS - ± 1/100  
 DECIMAL DIMENSIONS - ± .005  
 ANGULAR DIMENSIONS - ± 2°

NOTES UNLESS OTHERWISE SPECIFIED



19156

REV	DESCRIPTION	DATE	APP	S.S.
A	REL FOR MTG	7/4	7/4	1948

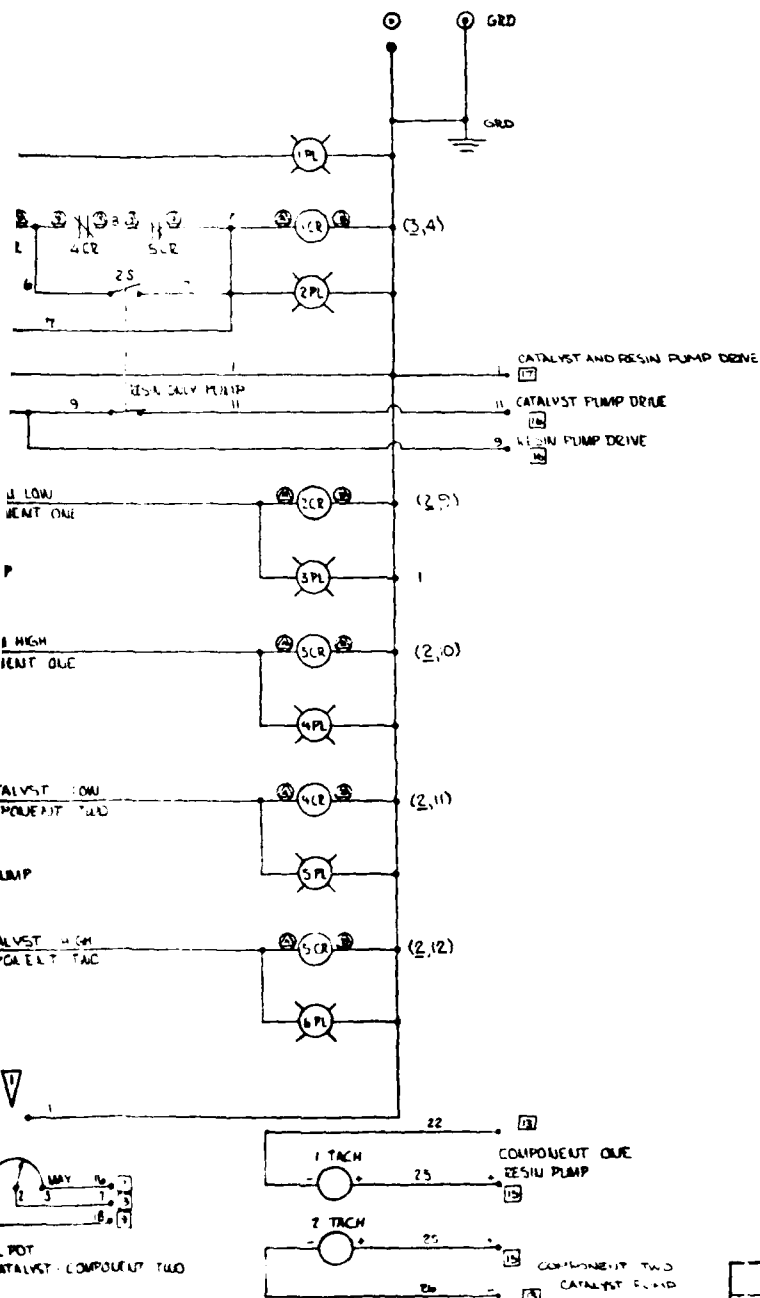


FIGURE 54

DRAWING STATUS		DRAWN: J. G. L. (5-15-75)		RANSBURG CORPORATION INDIANAPOLIS, IND.	
CONFIDENTIAL	RELEASED FOR MFG	CHECKED W. J. P. 7/7/75		DATE: 1915	
REV. 1	LEN. 1000	SCALE: 1" = 1"		TITLE: ELECTRICAL SCHEMATIC COUNTER PANEL - TWO COMPONENT	
				SHEET NO. 19156 SHEET 1 OF 1	

the volume and ratio of these ingredients supplied to the disc plus receiving feedback information from the pressure differential switches (Figure 54).

The control panel contains the following:

- (a) A pair of RPM (revolutions per minute) meters which provide a reference point to establish component ratio. These meters are calibrated to read approximate cc/min. fluid flow.
- (b) A pair of three turn dials which control the individual pump motor speeds. These enable the ratio to be varied from 1:1 to 20:1 on either side.
- (c) A light marked "Panel Power", which indicates the pump motors and panel are powered.
- (d) A rheostat marked "Master Speed Control" which controls the speed of both pumps synchronously. This is the control used to change the total flow rate once the ratio is set.
- (e) A pair of buttons marked "On" and "Off" which control the start and stop of both pump units. This function can also be controlled by the explosion-proof switch located near the spray booth.

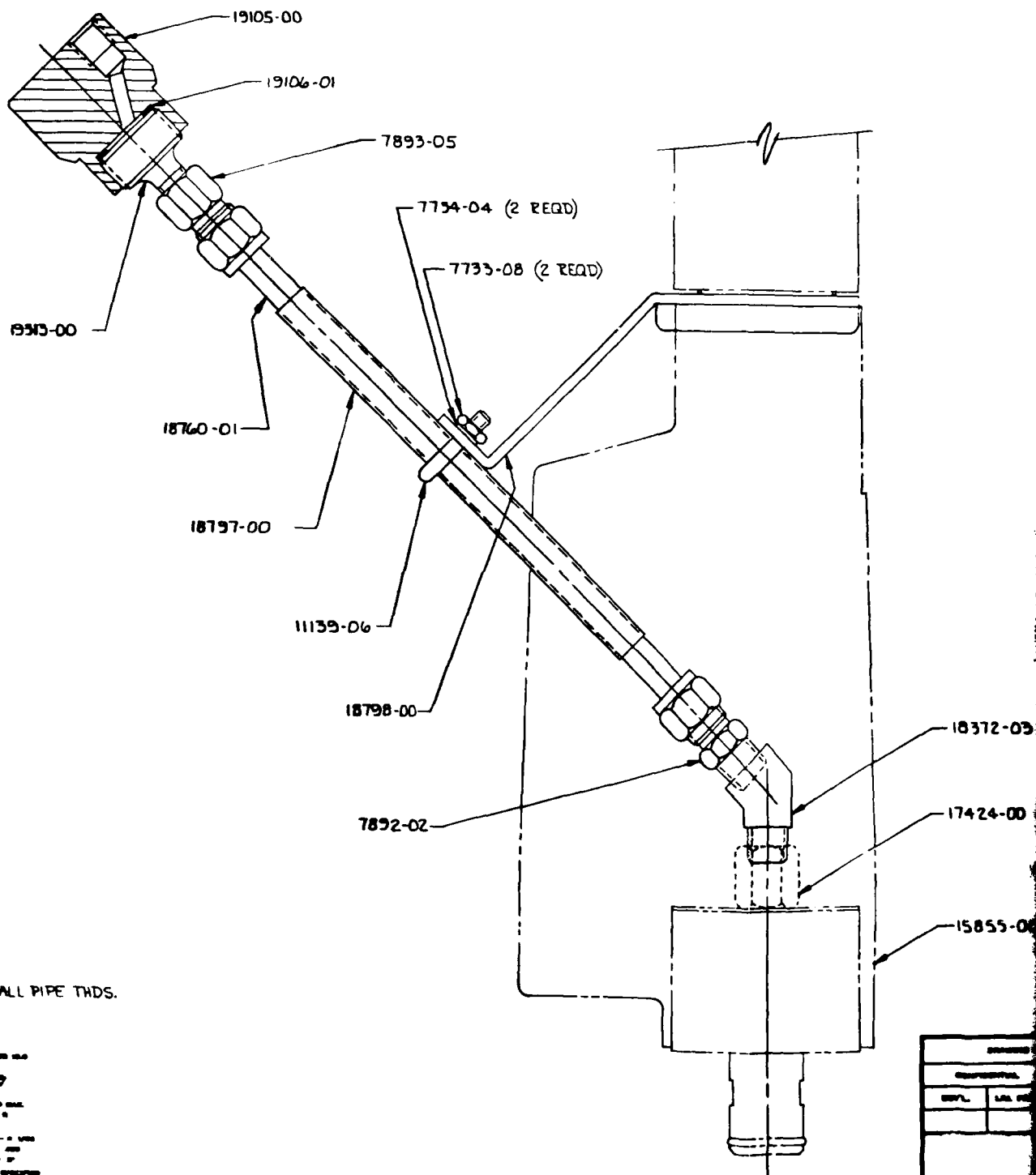
(f) Four lights marked "Component One, High Pressure" and "Low Pressure": "Component Two, High Pressure" and "Low Pressure". These lights when on, indicate that the pressure differential switch has signaled an out-of-range condition or a malfunction in the system.

(g) A two-position switch marked "Override" "On-Off". This switch provides a by-pass function for the differential switches which enables the system to be operated for trouble shooting purposes. It is also used for start up.

(h) A two-position switch marked "2-Comp" and "Resin Only". This switch provides a means to operate the resin pump only. This function can also be controlled by the explosion-proof switch located near the spray booth.

### 3. Static Mixer and Flush System

The static mixer assembly, (Figure 55), is mounted at the spray disc. It has three inlets and one outlet. These inlets receive the supplies "A" component, "B" component and flushing solvent. The "A" and "B" components are supplied through feed lines from the gear pumps, (Figure 49), and the flushing solvent comes from a pressurized container, (Figure 56), near

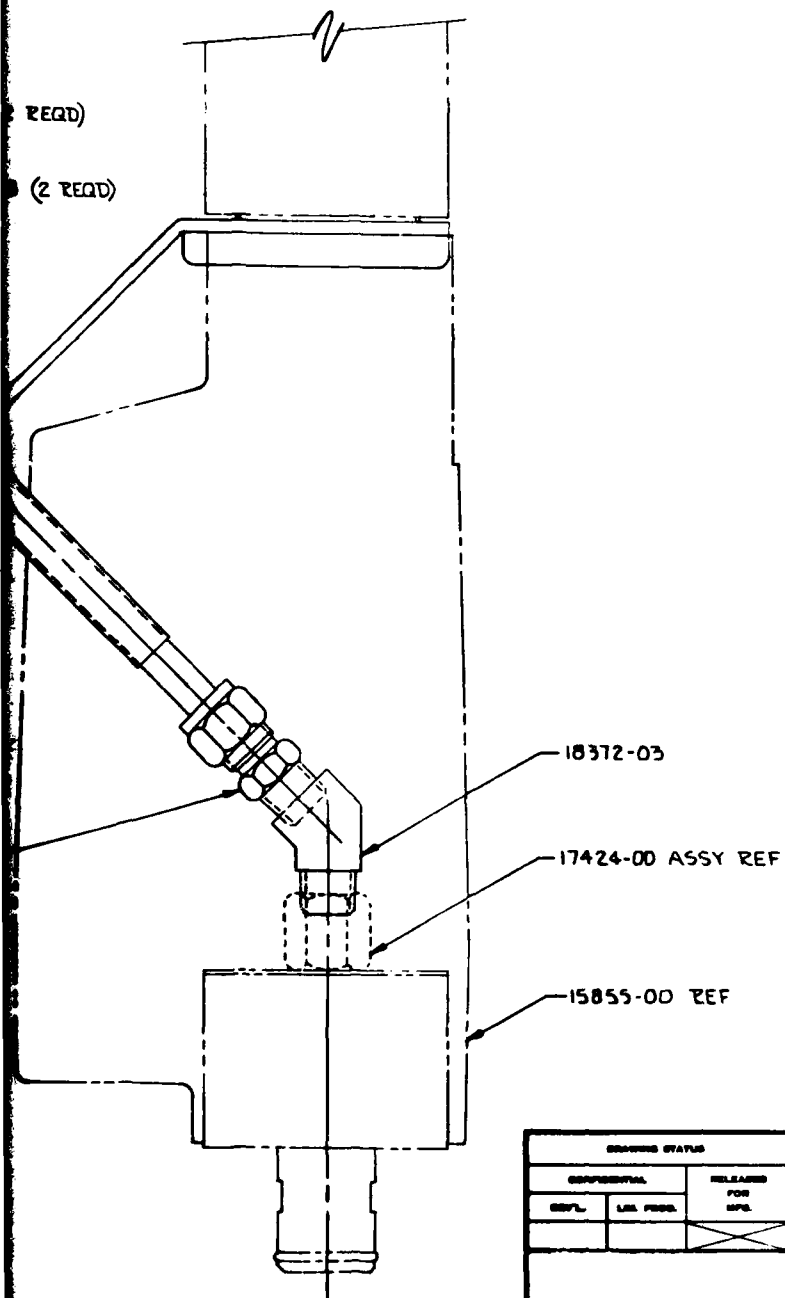


5. TEFLON TAPE ALL PIPE THDS.

ALL DIMS. IN INCHES  
 DIMENSIONS TO CENTER UNLESS NOTED OTHERWISE  
 DIMENSIONS TO SURFACE UNLESS NOTED OTHERWISE  
 DIMENSIONS TO EDGE UNLESS NOTED OTHERWISE  
 DIMENSIONS TO CORNER UNLESS NOTED OTHERWISE  
 DIMENSIONS TO CENTER UNLESS NOTED OTHERWISE  
 DIMENSIONS TO SURFACE UNLESS NOTED OTHERWISE  
 DIMENSIONS TO EDGE UNLESS NOTED OTHERWISE  
 DIMENSIONS TO CORNER UNLESS NOTED OTHERWISE

REVISIONS	
NO.	DATE
1	10/1/70
2	10/1/70
3	10/1/70
4	10/1/70
5	10/1/70

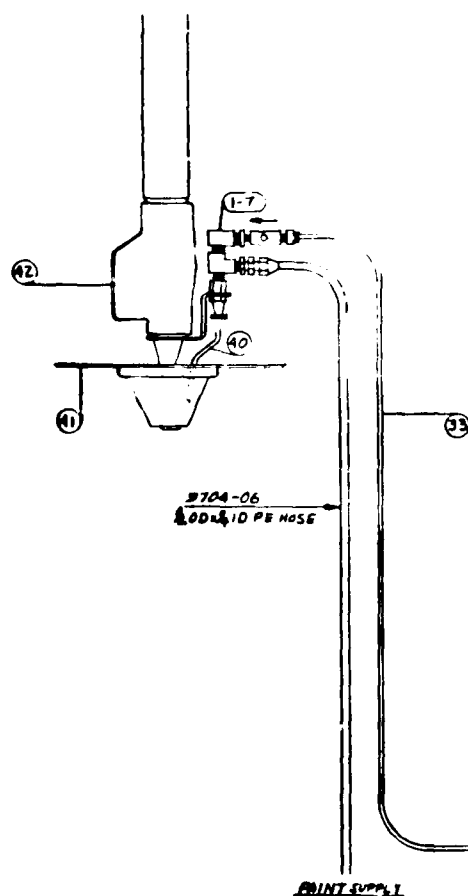
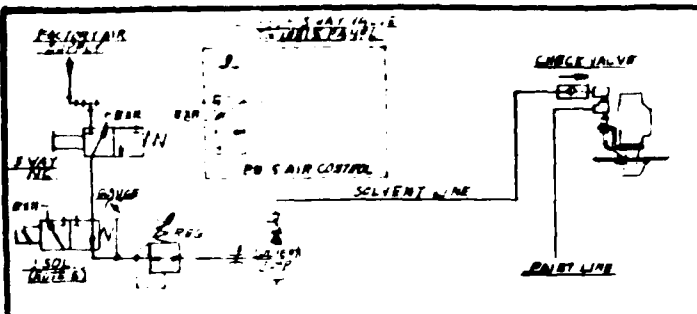
REV.	REVISION	DATE	APP.	S.D.
A	REL FOR WPS			12/10



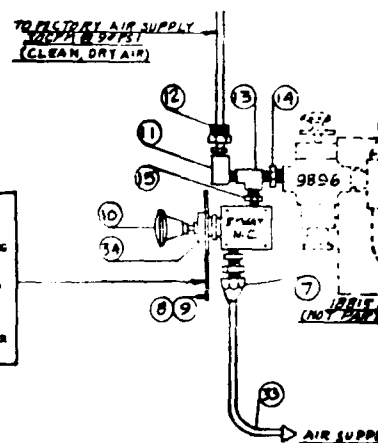
18799

FIGURE 55

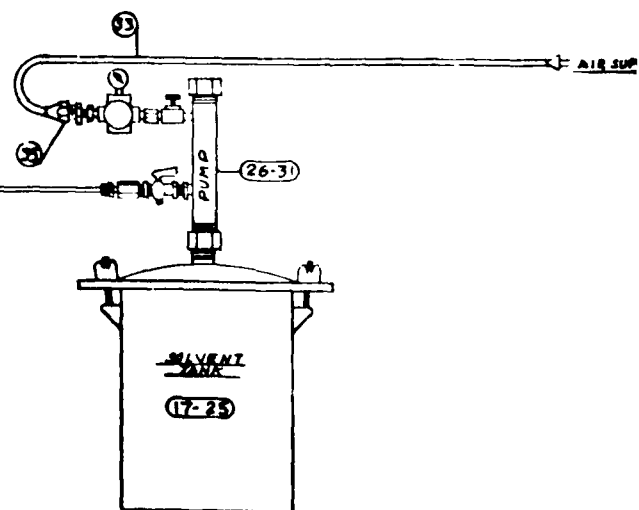
DRAWING STATUS				DRAWN 2-15-77 J. SMEDLEY			
CONFIDENTIAL		RELEASED FOR INFO.		CHECKED 4-25-77			
ENGR.	LES. PROG.			ENG. APP.		NEXT ASSY	
				MAYFL.		TITLE MIXER MTG ASSY	
				SCALE 1:1		DWG NO. 18799	
						- GENICS MIXER -	
						BY T. OF	



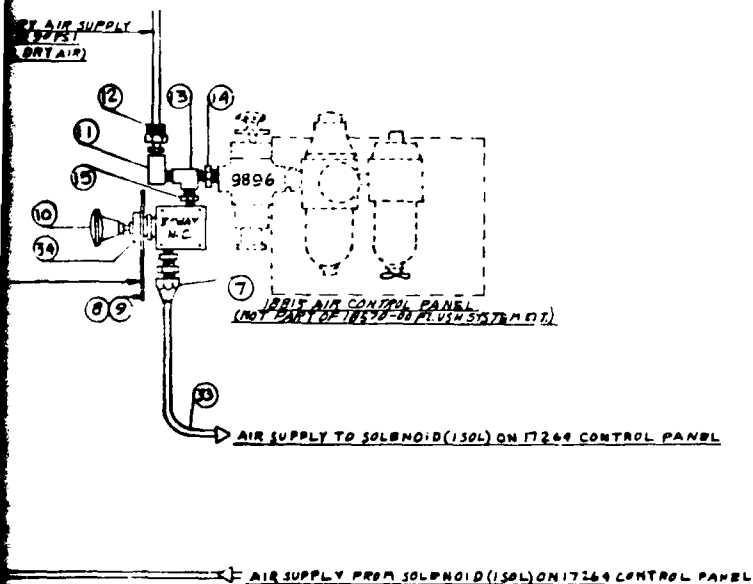
**18986-08 CAUTION NOTE**  
 INSURE THAT VENTILATING APPARATUS FOR THE SPRAYING AREA IS OPERATING AND THAT THE HIGH VOLTAGE TO THE SPRAYER IS TURNED OFF BEFORE PRESSING THIS BUTTON. FAILURE TO OBSERVE THIS CAUTION MAY CREATE HAZARDOUS OPERATING CONDITIONS. REFER TO THE INSTRUCTIONS ACCOMPANYING THIS EQUIPMENT FOR FURTHER INFORMATION.



- 4. AS LEVEL**  
 CRITICAL  $\pm$  0.1  
 MAJOR  $\pm$  0.05  
 ALL OTHERS ARE  
 DECIMALS 0.05  
 FRACTIONS & ANGLES TO 0
- 5. SURFACE FINISH**  
 MACHINED SURFACES  $\pm$  0.005  
 CAST SURFACES  $\pm$  0.01
- 6. BREAK SHARP EDGES 0.010 MAX**  
 FILLETS TO BE 0.010 MAX R
- 7. TOLERANCES**  
 FRACTIONAL DIMENSIONS  $\pm$  1/16  
 DECIMAL DIMENSIONS  $\pm$  0.005  
 ANGULAR DIMENSIONS  $\pm$  2'
- NOTES: UNLESS OTHERWISE SPECIFIED



Light	Red + Green	Blue + Yellow	Blue + Red	Blue + Green



### SEPARATING INSTRUCTIONS

[illegible]

1. **DO NOT PERFORM CLEANING OPERATIONS WITH THIS EQUIPMENT UNLESS THE VENTILATION APPARATUS FOR THE SPRAYING AREA IS IN OPERATION AND UNLESS THE HIGH VOLTAGE IS TURNED OFF.**
2. **OPERATE THIS CLEANING APPARATUS FOR THE MINIMUM TIME NECESSARY TO CLEAN THE SPRAYER.**
3. **CONDUCT YOUR COATING MATERIAL SUPPLIER FOR RECOMMENDATIONS AS TO WHAT SOLVENT TO USE TO CLEAN THE SPRAYER AND SELECT A SOLVENT PRESENTING THE LEAST FLAMMABILITY AND TOXICITY HAZARD.**
4. **DO NOT ENTER THE SPRAYING AREA UNTIL THE VENTILATION EQUIPMENT HAS REMOVED THE SOLVENT VAPOUR FROM THE AREA.**
5. **OPERATING PERSONNEL MUST BECOME FAMILIAR AND FOLLOW THE PRECAUTIONS AND OPERATING INSTRUCTIONS CONTAINED IN THE BOOKLET ENTITLED "OPERATING YOUR ELECTRO-STATIC COATING SYSTEM SAFELY". THIS BOOKLET IS PROVIDED WITH YOUR PUSH BUTTON NO. 2 PROCESS CLEANING SYSTEM 10570-00.**
6. **1 SOL. LOCATED ON 1726A CONTROL PANEL AND OPERATED FROM N.V. CONTROL RELAY COIL BOR LOCATED ON 1726A PANEL. TERM. 01A & 01.**
7. **SP N.V. SWITCH IN SYSTEM 1 SOL. OPERATED FROM N.V. SWITCH RELAY COIL FOR TERM. 050 & 01, FOR STATION 01.**  
**2 SOL. STA. 2 RELAY COIL BOR, TERM. 070 & 01.**

FIGURE 56

**NOT PART OF  
18570-00 PLUSH SYSTEM KIT**

40	3	2425P-00	AIR ROTATOR
41	1	16775-00	BASE-GEOP HELL (15" OR 20")
42	1	17470-00	FEED FLYE ASS'Y. (OR 8127-00)
43B	1	10570-00	MANUAL FLUSH SYSTEM KIT (SEE INC. 65170-00)
QTY.	QTY.	P.C. PART NO.	IDENTIFICATION

DRAWING STATUS		DRAWN <u>P 2578</u> BY <u>CP CORVA</u> CHECKED _____	<b>RANSBURG</b> <del>SECRET</del> <b>CORPORATION</b> INDIANAPOLIS, IND.
CONFIDENTIAL	RELEASED	ENG APP _____ DATE _____ REPLY _____	
COPYL _____ USE PROG _____	FOR INFO	SPECIAL _____ REPLY _____	TITLE <u>10570-00K T.P. # 444, 45</u> <u>P. 10570-00K T.P. # 444, 45</u> <u>DISK WITH A P. 10570-00K</u> <u>10570-00K T.P. # 444, 45</u>

the air supply for the spray disc speed control. The flush system is activated only after a run using the "A" and "B" component streams. The static mixer assembly is a tube containing twelve mixer elements called interfacial surface generators. These elements thoroughly mix the "A" and "B" component just prior to entering the well in the spray disc, thus allowing short pot life materials to be sprayed.

4. Conveyor and Spray Booth

An overhead loop conveyor (Figures 39, 40, 41, 42, and 43), utilizing a link-chain driven by a variable speed motor drive is used to carry the boots into the electrostatic spray booth. The chain has a swivel mechanism located on twenty-inch centers, and this swivel is engaged by a second drive chain inside the spray booth that rotates the boot fastened to the swivel as it passes through the booth. The conveyor can transport at a rate of twenty-eight inches per minute.

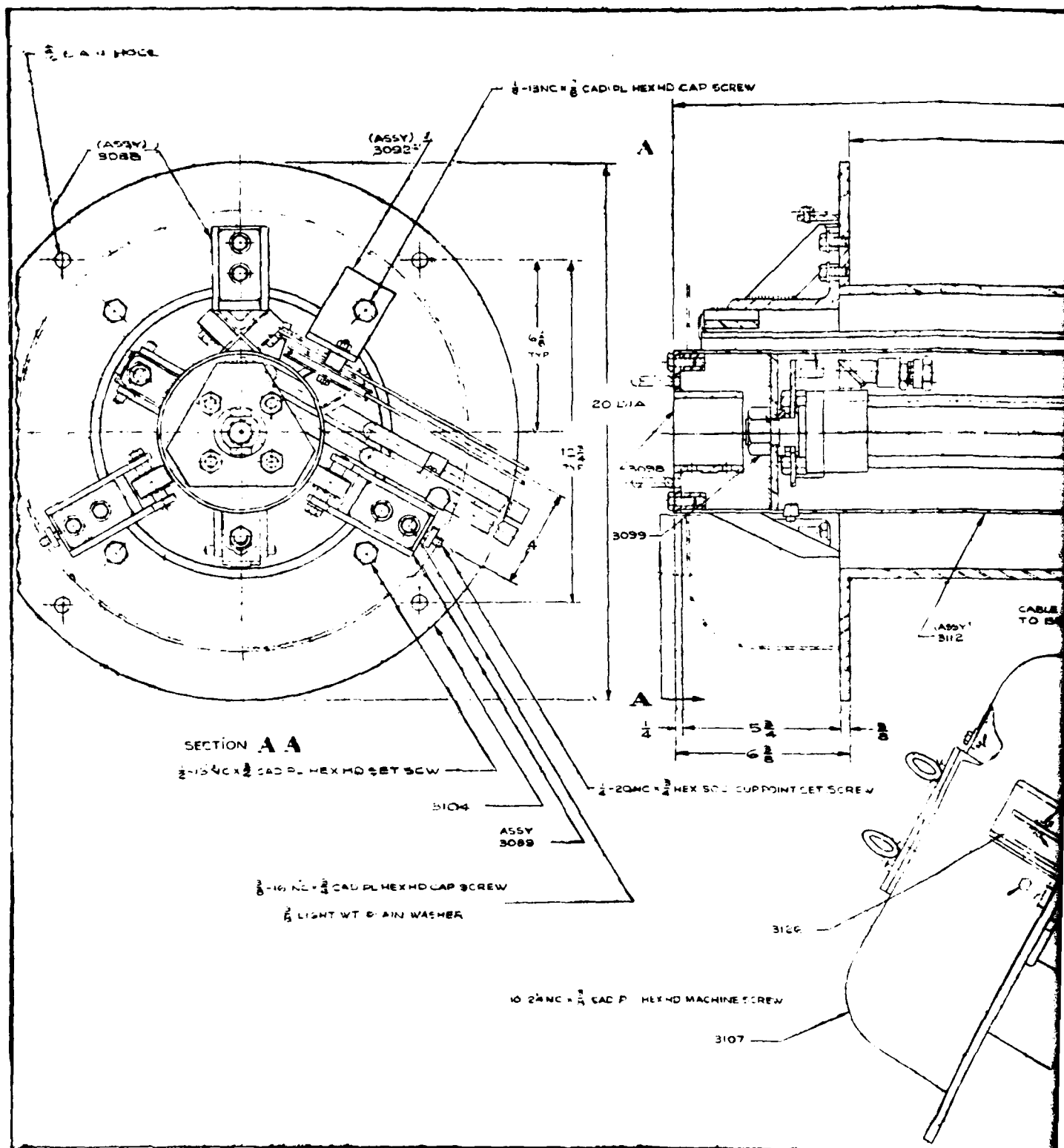
The sheet metal cylindrical-shaped spray booth (Figure 46) has an open front to allow entrance and exit of the drive chain conveyor. Fumes are evacuated into filtered vents at the bottom of the spray booth that are hooked into a blower system. There are eight spray stations in the booth at any one time.

Inside the spray booth is a thirty-six inch stroke overhead mounted reciprocator (Figure 57), which is operated hydraulically and is supplied with power from a self-contained hydraulic pump unit. The rate of reciprocator travel up and down can be regulated at the hydraulic pump unit (Figure 44). The length of the stroke is controlled by limit switches that are activated by a dog on a cable drive assembly (Figure 44).

The fourteen-inch diameter spray disc with air drive motor is attached to the end of the reciprocator. The speed of rotation can be varied from 0 to 4000 RPM, depending on the air pressure setting.

5. Spray Last

Aluminum spray lasts (Figure 45) are used inside the boots to be sprayed and act to attract the positively charged outer coating particles since the last is grounded through the conveyor. The lasts are thinner walled than the normal cast last to reduce the weight on the conveyor. Last sizes can be two sizes smaller than the boot to be sprayed. This facilitates mounting and removing boots from the last. A removable toe section was also designed into the last to further ease stripping.



3042

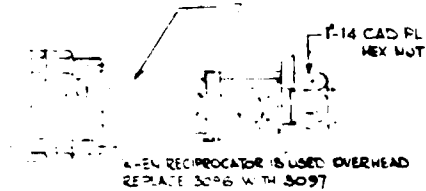
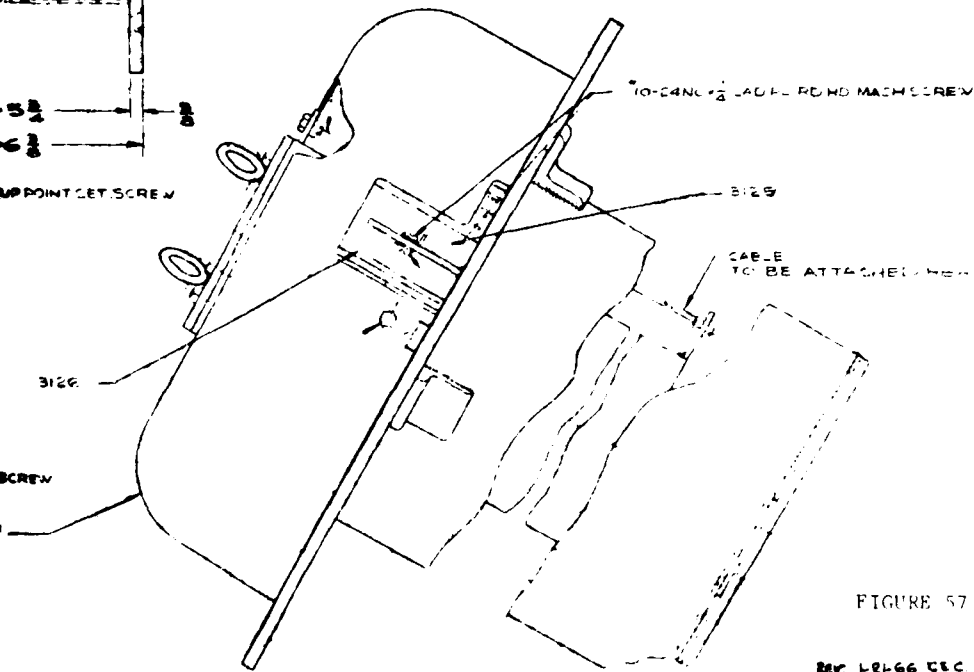
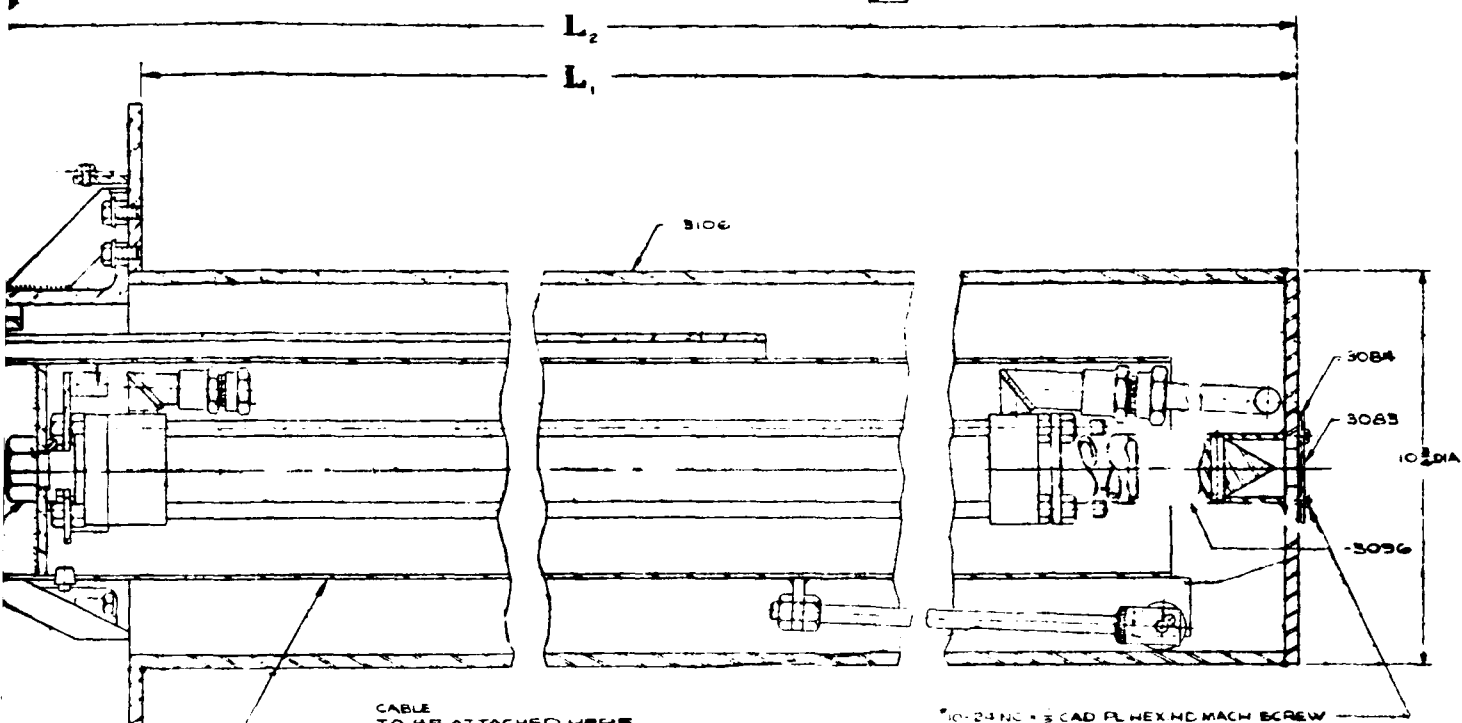


FIGURE 57

REV. 12-66 CEC

180	3042-180	225	23 1/2"
168	3042-168	2.0	21 1/2"
156	3042-156	1.95	20 1/2"
144	3042-144	1.80	18 1/2"
132	3042-132	1.63	16 1/2"
120	3042-120	1.46	15 1/2"
108	3042-108	1.29	13 1/2"
96	3042-96	1.17	12 1/2"
84	3042-84	1.02	10 1/2"
72	3042-72	.89	9 1/2"
60	3042-60	.73	7 1/2"
48	3042-48	.59	6 1/2"
36	3042-36	.47	5 1/2"
24	3042-24	.35	4 1/2"
STROKE ASYNS 1, DIA L LIM			
LEES MANUFACTURING CORP.			
P.O. BOX 1000, CUDAHY, ALA.			
FOR CONCENTRIC TUBE RECIPROCATOR			
DATE	10-1-67	DWG NO.	3042
NO. 1	COMPLETE ASSY.		

6. Drying Truck and Drying Oven

As boots are removed from the conveyor they are placed on a four-shelf truck (Figure 47), made up of an angle iron frame with expanded metal shelves. The expanded metal allows free circulation of air. The trucks will hold sixty pair of boots and are constructed to accomodate sizes 4 to 14.

The oven is a hot-air circulating oven, (Figure 48), and is vented to the outside. It can be set to run a three-phase cycle with the initial cycle recirculating room-temperature air, followed by a cure cycle and then going into a long term heat soak cycle. The length and temperature of any one of the cycles can be varied by adjusting the setting on the three feed-back temperature controllers.

C. Operation Sequence For Electrostatic Spraying

1. Fill the "A" and "B" component supply tanks with compound from the mixing tanks. This is done by applying nitrogen pressure to the mix tanks and feeding compound to the respective supply tank by a hose connected to the bottom drain.
2. After supply tank, (Figure 52), is filled, start agitator, seal tank and apply slight positive pressure to insure a compound supply to the metering pumps.

3. Fill supply tank for the flush system, (Figure 56).

4. Take ratio check:

(a) At the main control board, (Figure 53), turn on the main power switch.

(b) At the control pane, (Figure 53), turn override switch to "On".

(c) Turn panel power switch to "On".

(d) Set ratio one ("A" component) and ratio two ("B" Component) to proper setting on dial.

<u>One</u>	<u>Two</u>
1.93	1.035

(e) Set Master Control to proper percentage to give desired throughout.

8W	50%
9R	50%
9W	52%
10R	53%
11R	55%
14XW	58%

(f) At the spray booth, disconnect "A" and "B" component supply hoses from static mixer, (Figure 55).

(g) Turn "A" component and "B" component pumps "ON" (Figure 50).

(h) Catch components in individual cups as compound leaves supply hose.

(i) Turn off pumps.

- (j) Weigh compound in cups. Ratio of "A" component to "B" component should be 100:24.9. If ratio varies by more than two percent, adjust "B" to "A" on control panel and repeat ratio check until the correct proportions are obtained.
  - (k) Check gel rate by stirring a small amount of "A" and "B" in a 4:1 ratio in a cup. Turn cup at <sup>o</sup>45 angle slowly until compound no longer "rolls". Time from mix to gel should be approximately 3½ minutes.
5. Set up Spray Unit:
- (a) Set reciprocator limit switches, (Figure 44). Set switch for long stroke to travel from 47 inches to 54 inches above floor height. Set switch for short stroke to travel from 54 inches to 61 inches above floor height. Activate control for percentage of long to short stroke in a ratio of 3:4.
  - (b) Set conveyor speed for 20 inches - 50.8 cm/minute.
  - (c) Set last rotation for 3.2 rev/minute.
  - (d) Set disc air pressure control to 25 psi (1350 rev/min).
6. Spray Boots:
- (a) Re-attach supply hoses to static mixer.
  - (b) Hang target panels (10" x 14" x 1/8" aluminum plates) on first eight conveyor hooks to go into spray booth. Load boots on subsequent hangers.
  - (c) Turn main switch On. Set High Voltage to 90,000 volts.
  - (d) Set by-pass to Off.
  - (e) Turn blower On.

- (f) Turn hydraulic unit
- (g) Start spray disc.
- (h) Turn Hi-Voltage On.
- (i) Start metering pumps for "A" and "B" components.
- (j) Reset control panel "On" button.
- (k) Turn rotator chain On.
- (l) Turn conveyor On.
- (m) As target plates come out of the spray booth to the unload and load station, remove and hold.
- (n) Spray required number of boots by placing unsprayed boots on the conveyor hooks as they pass load and unload station.
- (o) Remove sprayed boots at unload station and place on drying truck.
- (p) At end of the run re-hang target plates so they will be in spray until all boots exit. This will assure correct amount of coating is deposited on boots.

7. Flush Spray Disc:

- (a) Turn Off Hi-Voltage (The supply pumps turn off automatically).
- (b) Turn rotator Off.
- (c) Turn conveyor Off.
- (d) Turn hydraulic off at low point of stroke.
- (e) Pressurize flush supply tank, (Figure 56), and force cleaning solvent to the revolving spray disc. Repeat several times to insure residual material is cleaned from static mixer and spray disc well.

8. Dry and Cure Boot Outer Coating:
  - (a) Load truck, (Figure 47), with sprayed boots into drying and curing oven, (Figure 48).
  - (b) Set cycle controllers as follows:
    - 24 minutes - Room temperature air
    - 24 minutes - Cure at 260<sup>o</sup> F (126.7<sup>o</sup> C)
    - 10 hours - Post Cure at 160<sup>o</sup> F (71<sup>o</sup> C)
  - (c) Start cycle controllers
  - (d) After the oven cycle time has been completed remove truck from oven.
9. Remove last from sprayed boot. Remove leg section and then toe section.
10. Weigh and inspect boot. Record weight in grams and inspect.
  - Apply Silicone Finish (EXXIT II, Contour Chemical Co.).
11. Trim boot to proper height (10 $\frac{1}{4}$ " min - 26 cm)  
Use Automatic Boot Trimming Machine. (Two Rotating Circular Knives cut off top of boot).
12. Attach snow collar: (Details in Section III).
  - (a) Eyelet Collar
  - B) Stamp Collar with required information.
  - (c) Turn collar halves.
  - (d) Lockstitch collar halves together.
  - (e) Attach collar to boot.
  - (f) Insert Lace

13. Mate left foot to right foot of same size boot.
14. Transport to packing area for shipment. Complete packaging details are attached to this section.

D. BOOT PACKAGING AND WAREHOUSING

The following packaging method has been developed based on the size 10R boot and may require some modification to accommodate the larger XW sizes.

1. Packaging Method

One chipboard tube shall be placed inside each boot. Each boot is then compressed so that the tube becomes oval.

A printed instruction tag, having a hole in its folded upper left hand corner, shall be inserted with the lace of the left boot only. The two ends of the lace shall be loop-tied. The mated right foot boot lace ends shall also be loop-tied. The flat die-cut carton (Figure 58) is then assembled. One sheet of tissue paper is placed on the bottom with its edge parallel to the right panel and extending approximately 5" (12.7 cm) beyond. One boot is then placed on this tissue. This boot shall have its outsole parallel to the carton's rear panel and its back parallel to the right panel. The remaining portion of the tissue then covers this boot. A second sheet of tissue is placed with its end parallel to the carton's left side panel, extending approximately 5 inches (12.7 cm) beyond. The other mated boot, of the same size and width, is placed on this tissue with its back parallel to the carton's left side panel. The remaining portion of the tissue is then placed over this boot. The top flap is then closed inside the front panel, and secured at the edge with a 3" (76 cm) wide tape, extending approximately 1" (2.54 cm) down the front, printed panel. Six pair of one size only, \*packaged, shall be placed within the case (Figure 60). Bottom flaps of the case are closed by metal staples, two on each flap widthwise, plus two lengthwise. Top flaps shall be secured by a solid coating of glue Silicate covering the entire contact area. In addition, one strip of 3" wide water sensitive tape shall be placed over the top joining, and extending 2" down each end panel.

\*NOTE: Towards the end of the contract, when it becomes necessary to place two or more sizes within the same case, it is permissible to mix sizes, provided such case contains the proper size detail, plus a white printed label reading "MIXED SIZES". This label is placed alongside the other required case printing.

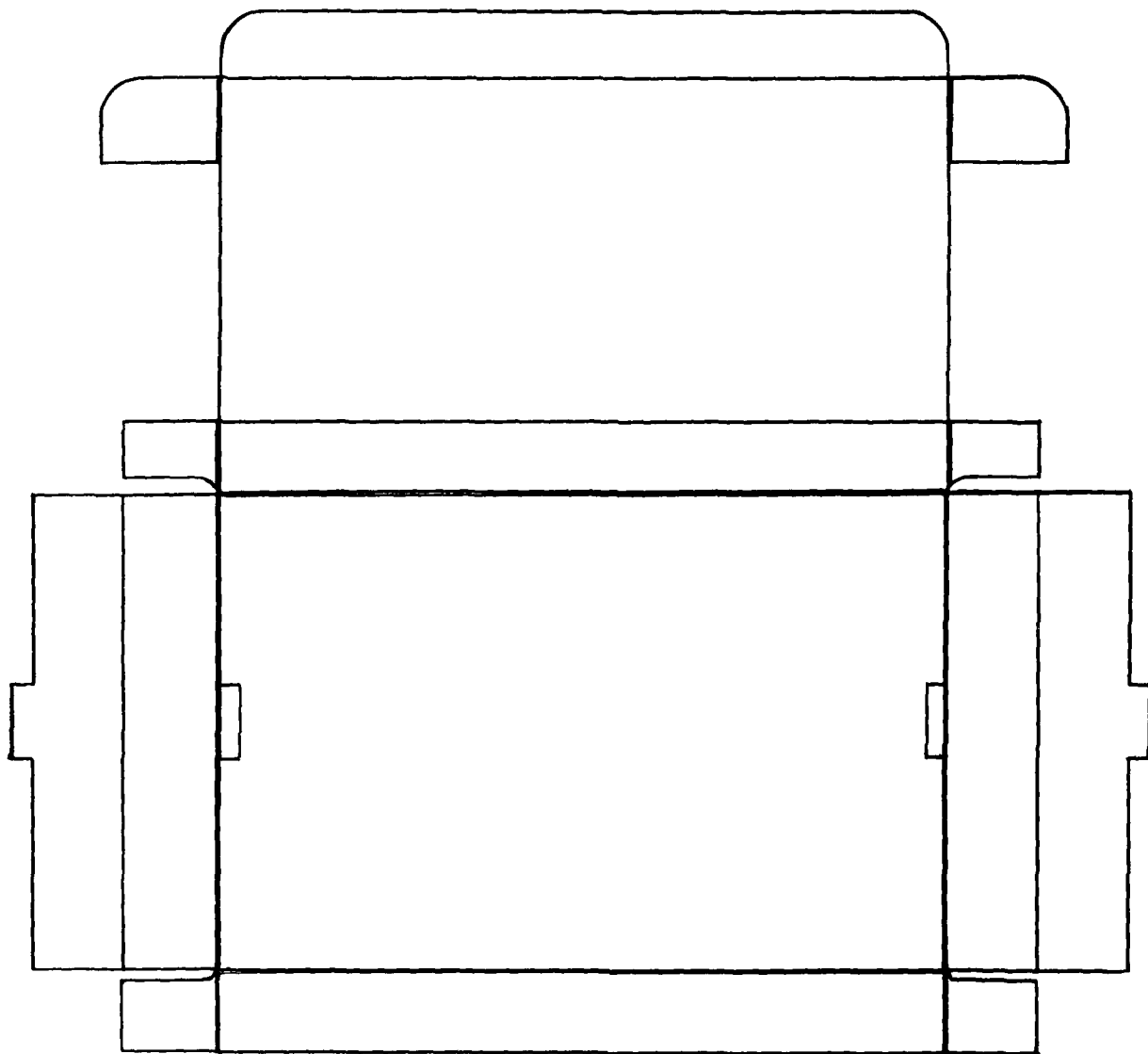


FIGURE NO. 58 DIE CUT CARTON

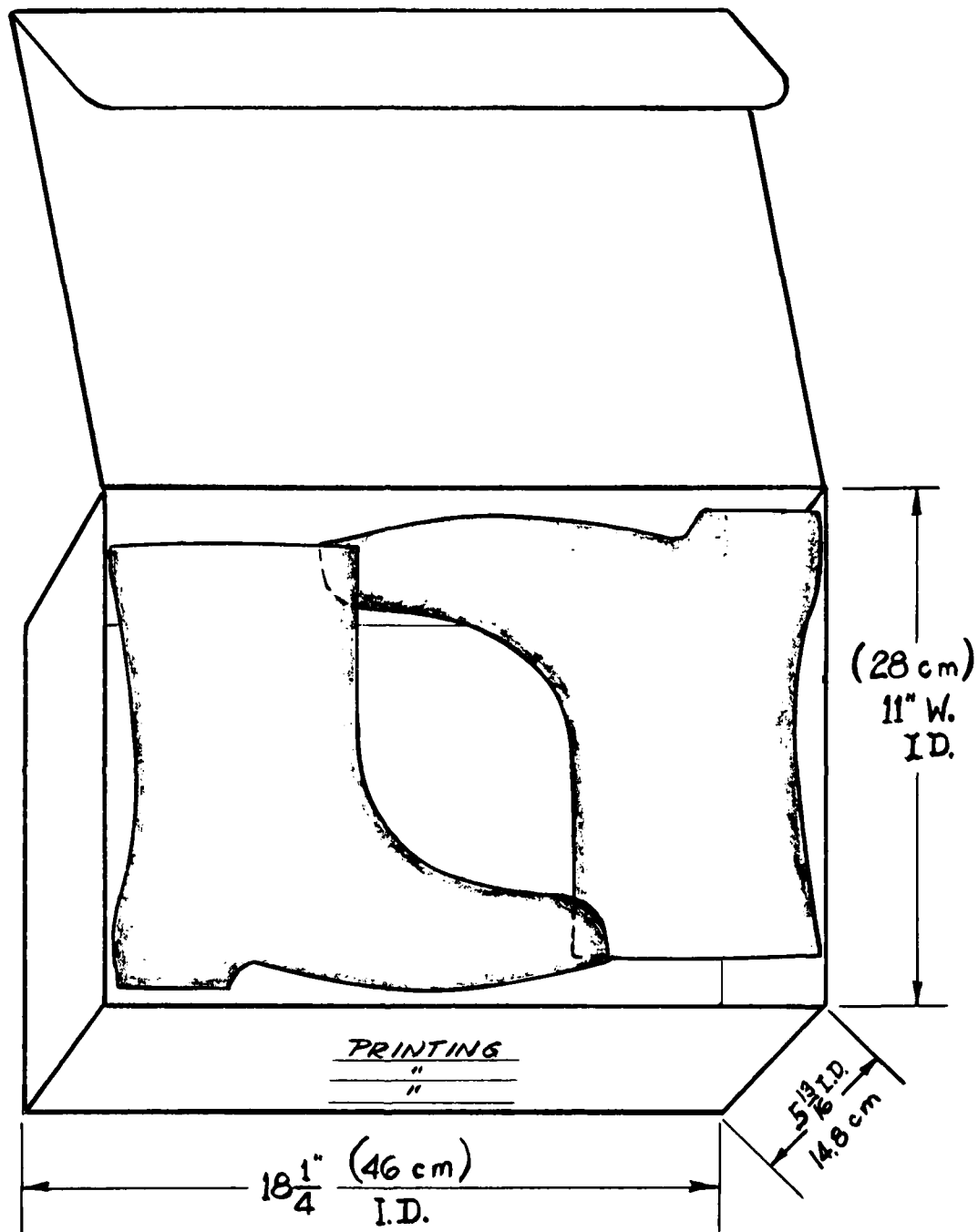


FIGURE 59 CARTON ASSEMBLY

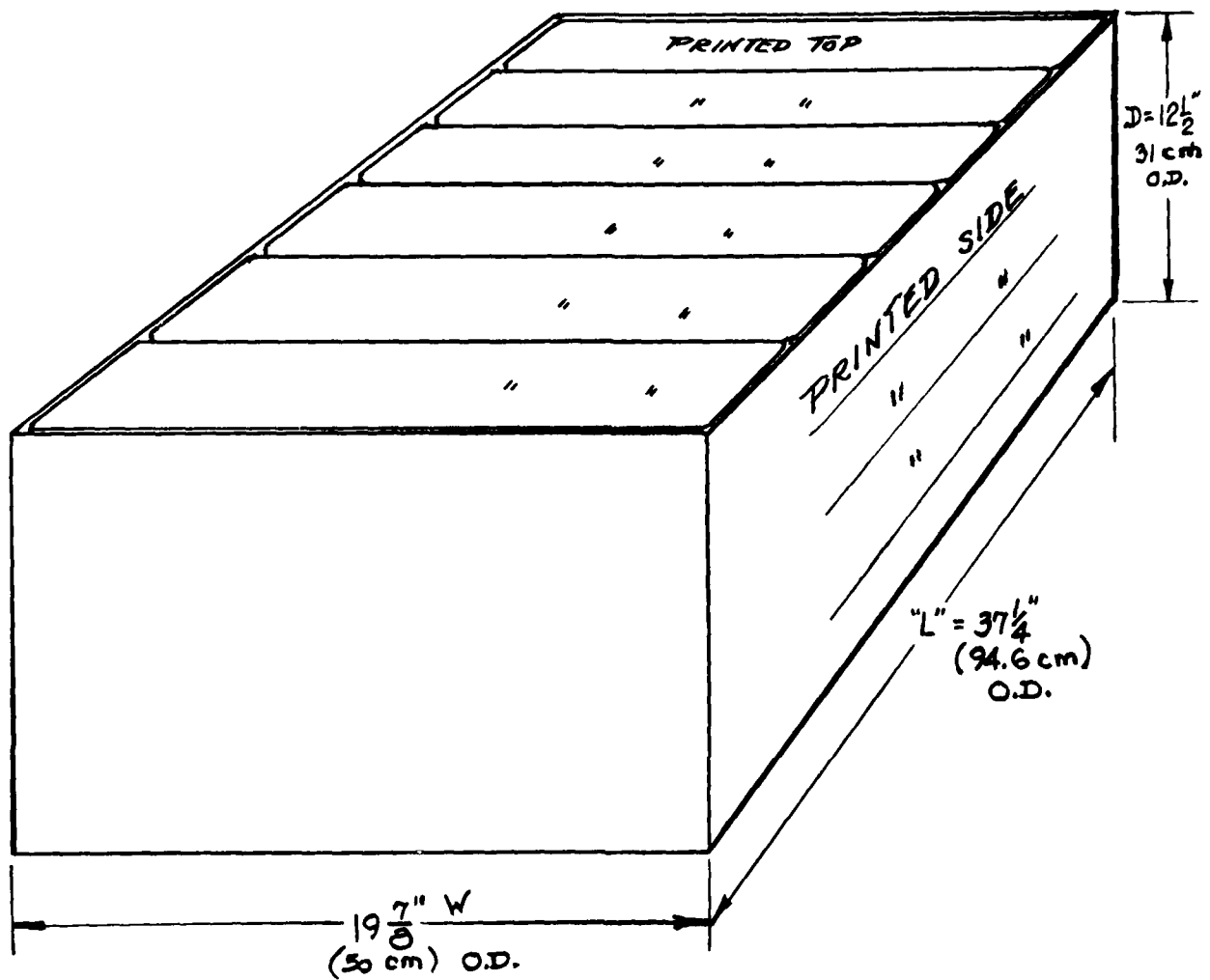


FIGURE 60 CASE LAYOUT

## 2. Packing Materials - Boot/Carton

- A. 0.040 Ca. Chipboard tube 9" (23 cm) x 6" (15.2 cm)  
Dia. Slit-Length 2/Br.
- B. Printed instruction tag 6½" (16.5 cm) x 5½" (14 cm)  
folded to 3½" (8.3 cm) x 5½" (14 cm) with 3/8"  
(0.95 cm) hole in upper left hand corner near  
fold, printed on 4 pages. 1/Pr.
- C. 15" (38 cm) x 24" (61 cm) white tissue paper  
2/Pr.
- D. Carton - Plain Kraft, Printed Front Panel  
Die-Cut, Self Locking  
C/F SW, B Flute, 200 Lb. test (90 Kilos)  
I. D. 18½" L (46.5 cm) x 11" W (28cm) x 5-13/16" D  
(14.8 cm) 1/Pr.
- E. 3" Wide (7.6 cm), 60 Lb. (27 Kilograms), Water  
Sensitive Glue Tape 3/Pr.

## Package Materials - Case

- A. Case - Plain Kraft, Printed Side Panel  
CF, RCS, SW, 275 Lb. Test (125 Kilos)  
Stitched Joint, Tab-Out 1/6 Pr.  
I. D. 37" L (94 cm) x 19-5/8" W (50cm)  
x 11¼" D (28.5 cm)  
O.D. 37½" L (94.5 cm) x 19-7/8" W (51 cm)  
x 12-1/8"D (31 cm) 5.2 cu. ft.

(0.15 cu meters)

- B. Staples on bottom flaps
- C. Glue brushed on top flaps contact surface

## 3. Carton Printing

To be printed by the case manufacturer, in the center  
of the front end panel using 5/16" (0.79 cm) black  
capital letters and numerals as follows:

(First 9 digits of the national Stock Number  
BOOT, BLACK, COLD WEATHER, INSULATED  
1 PAIR SIZE  
DAAG-17-76-C=0016  
A-MO/YR

The following is to be added at packing, using  
5/16" (0.79 cm) black capital numerals

4. Printing - Exterior Case

To be printed by the case manufacturer on one side panel, beginning in the upper 1/3rd portion, directly to the left, using 1/2" (1.27 cm) Black Capital letters and numerals as follows:

(First 9 digits of the National Stock No.)	FROM:
BOOT, BLACK	UNIROYAL, INC.
COLD WEATHER, INSULATED	NAUGATUCK, CT
6 PAIR	SIZE
WT.	LB.
	(KILOGRAMS)
UNIROYAL, INC.	5.2 cu. ft.
Naugatuck, CT 06770	0.15 cu. meters
SHIPMENT NO.	CO.

The following is to be added at Packing, using 1/2" (1.27 cm) Black Stencilling:

1st Line - The last four digits of the National Stock No.

4th Line - The actual Size

The following is to be added at Warehouse shipping, using 1/2" (1.27 cm) Stencilling:

5th Line - The actual weight

8th Line - The shipment number and company number

To the right:- in the line with "TO":  
- The consignee address

5. Warehouse Space

To warehouse 2,400 pair of boots (400 cases) 800 square feet (53.9 square meters) of floor space will be required. The warehouse will consist of five double rows of ten cases across by four cases high separated aisle ways. This layout may be subject to change, depending upon line location and local fire codes.

6. User Instruction Tag

The following user instruction tag was developed for the lightweight insulated boot and would be a purchased item.

INSTRUCTION TAG

BOOTS, COLD WEATHER, INSULATED, (BLACK) FOR WET-COLD USE

FACTS ABOUT THE INSULATED LIGHTWEIGHT BOOT

These boots have been designed to protect your feet from cold injury and frostbite in areas where moisture and cold are critical factors, and where the mean monthly temperature ranges between 14 F (-10°C) and 68°F (20°C). The boot should not be worn where temperatures fall below -20°F (-28.5°C).

The foot is kept warm through the use of microcellular polyurethane both in the upper section of the boot and the outsole.

Marching, running, or heavy work for long periods of time will cause the feet to sweat. However, this moisture cannot damage the insulation because of the waterproof lining inside the boot. The feet, even if damp, will stay warm. After a few days, your feet become used to this feeling. If these boots are worn continuously, the skin appears wrinkled and white as if it had been soaked in water. Drying the feet and putting on dry clean socks will eliminate this condition. If ice water spills into the boot, it warms to body temperature rapidly.

FOLLOW THESE INSTRUCTIONS:

Wear with one pair of socks, wool, cushion sole. Tie the lace of the snow collar snugly to hold the sock in place and to prevent slipping and wrinkling. Field trousers are to be worn outside the boots.

SIZES: Boots are supplied in whole sizes. Widths are EXTRA NARROW, NARROW, REGULAR, WIDE, EXTRA WIDE. Try on the same size insulated boots as your leather boot. If you wear a half size in leather boots, try on the next larger or smaller size for proper fit. MAKE SURE THE INSULATED BOOTS FIT PROPERLY. They have a "soft" fit. Be sure yours are large enough. Fit snug, but not tight.

Change socks at least once daily.

If your feet begin to get cold, button up all your garments and exercise, the entire body by swinging the arms, stamping the feet, and rapid movement of the toes.

Wash the inside of the boot with soapy water once a month.

TRENCH FOOT AND FROSTBITE are serious cold injuries which can cause painful and permanent disability. These injuries can be prevented by proper care of your feet. No boot will keep your feet from freezing if in sub-zero weather you remain motionless for several hours. Wear the insulated boot properly and DO NOT BECOME A COLD WEATHER CASUALTY!

(The above shall be printed on 6½" (16.5 cm) x 5½" (14cm) tag stock, so that when it is folded to 3¼" (8.3cm) x 5½" (14 cm) the wording shall be on the front and back of each of two pages).

NOTE: A 3/8" (0.95cm) hole shall be punched in the upper left hand corner of the fold.